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OEnothera and its Segregates.

By John K. Small.

The year 1835 marks a great crisis in the history of the genus *OEnothera* of Linnaeus. Edouard Spach then divided the genus into about a dozen, taking his characters from the flower and fruit The results of his observations were published in the Annales des Sciences Naturelles,* Histoire Naturelle des Végétaux,† and in his Monographia Onagrearum published in Nouvelles Annales du Muséum,‡ the last named work containing a complete exposition of his conclusions. Although Spach's work was considered good and reliable, his generic lines were not generally accepted, but were used to divide the composite genus *OEnothera* into sections.

Spach, however, was not the first to see that *OEnothera* contained many generic types. In 1763 Adanson published *Onagra*, Rafinesque established *Meriolix* in 1818, in the same year Link separated *Chamissonia* (not *Chamissoa* H.B.K.), and later several genera were proposed by Nuttall.

Between 1835 and the present time authors have at one time or another eliminated one or two genera from *OEnothera*, but it was not until 1893, when Rud. Raimann prepared the Onagraceae for Engler and Prantl's Natürlichen Pflanzenfamilien,§ that any systematic or logical subdivision of the genus into several genera

*(II.) 4: 163–168.

†4: 347–379.

‡(III.) 4: 321–407.

§3: Abt. 7. 199–223.

appeared. Raimann's conclusions are based on Spach's work, but he has presented them in a much more satisfactory manner than was indicated by the earlier author.

The committee which prepared the List of Pteridophyta and Spermatophyta of Northeastern North America,* adopted Raimann's interpretation, and it was suggested by Dr. Britton that I make an examination of the material in the Herbarium of Columbia University to ascertain to what extent the characters hitherto assigned for generic lines held. The study has been interesting both from a generic and a specific standpoint in exposing the strong tendency to mass, and to maintain composite species and genera where clear and constant characters exist both in habit and in the more minute morphology.

The following pages contain the results of these observations on the North American species.

I will be glad to receive additional material, either specimens or seeds, for examination. Proposing to present a monograph of this group at an early day.

Key to the Genera.

Flowers regular (stamens equal in length.)
- Stigma deeply four-cleft, its segments linear.
  - Ovules and seeds horizontal, inserted in two or rarely in several rows, prismatic-angled. 1. ONAGRA.
  - Ovules and seeds ascending, not angled.
    - Buds erect; flowers yellow; ovules and seeds in one row. 2. OENOTHERA.
    - Buds drooping; flowers pink; ovules and seeds in two rows. 3. ANOGRA.
- Stigma entire or rarely four-toothed.
  - Ovaries and capsules sessile or nearly so, subglobose or elongated.
    - Calyx-tube longer than the ovary.
      - Stigma capitate; calyx-tube slender, usually adherent to the style. 10. TARAXIA.
      - Stigma disk-like; calyx-tube funnelform. 11. GALPINSIA.
    - Calyx-tube shorter than the ovary.
      - Stigma disk-like, slightly four-toothed; calyx-tube broadly funnelform, sometimes twice shorter than the ovary. 12. MERIOLIX.
      - Stigma capitate; calyx-tube campanulate or somewhat funnelform, many times shorter than the ovary.

* Mem. Torr. Club, 5.

Capsules incompletely four-celled; calyx-tube with a lobed disk in its throat. 13. EULOBUS.

Capsules with complete septa; calyx-tube naked at the throat. 14. SPHAEROSTIGMA.

Ovaries and capsules long stalked, more or less club-shaped. 15. CHYLISMA.

Flowers irregular (the alternate stamens longer).

Ovules and seeds numerous, not tuberculate, clustered on slender funiculi; capsules club-shaped.

Flowess yellow 4. KNEIFFIA.

Flowers red, purple or white. 5. HARTMANNIA.

Ovules and seeds few, sessile, in one or two rows.

Plants normally acaulescent.

Capsules obtusely or retusely four-angled; seeds with a deep furrow along the raphe. 6. PACHYLOPHUS.

Capsules sharply four-angled; seeds with a tubercle at one end. 7. LAVAUXIA.

Plants caulescent.

Stems diffuse and wiry; leaves 1–2 cm. long; capsules sharply four-angled. 8. GAURELLA.

Stems not diffuse, stout; leaves 4–15 cm. long or longer; capsules broadly winged. 9. MEGAPTERIUM.

1. ONAGRA Adans. Fam. Pl. 2: 85. 1763.

Plants annual or biennial.

Flowers small; petals 2–4 mm. broad. 1. *O. cruciata.*

Flowers large; petals one or several centimeters broad.

Calyx-tubes slender, 2.5–5 cm. long.

Stems decumbent; pubescence rather dense, short and appressed. 2. *O. depressa.*

Stems erect or nearly so.

Pubescence villous-hispid, strigose or soft and appressed; species ranging east of the Rocky Mountains.

Capsules 2–2.5 cm. long, abruptly narrowed at the apex 3. *O. biennis.*

Capsules 3–4 cm. long, gradually narrowed from near the base. 4. *O. Oakesiana.*

Pubescence hirsute or canescent-hirsute; species ranging west of the Rocky Mountains. 5. *O. Hookeri.*

Calyx-tubes stout, 6–13 cm. long

Leaves distantly toothed, minutely ciliate. 6. *O. Jamesii.*

Leaves entire, with short bristle-like cilia. 7. *O. macroceles.*

Plants perennial. 8. *O. arguta.*

1. ONAGRA CRUCIATA (Nutt).

OEnothera cruciata Nutt.; Ser. in DC. Prodr. 3: 47. as synonym. 1828.

OEnothera biennis var. *cruciata* T. & G. Fl. N. A. 1: 492. 1840.
Onagra biennis cruciata Britton, Mem. Torr. Club, 5: 233. 1894.
Vermont and Massachusetts.

2. ONAGRA DEPRESSA (Greene).

OEnothera depressa Greene, Pitt. 2: 216. 1891.
Rocky Mountains of Montana.

3. ONAGRA BIENNIS (L.) Scop.

OEnothera biennis L. Sp. Pl. 346. 1753.
OEnothera muricata L. Syst. Ed. 12, 263. 1767.
OEnothera angustifolia Mill. Dict. Gard. Ed. 8, no. 2. 1768.
OEnothera glabra Mill. Gard. Dict. Ed. 8, no. 3. 1768.
Onagra biennis Scop. Fl. Carn. Ed. 2, 1: 269. 1772.
OEnothera graveolens Gilib. Fl. Lituan. 2: 168. 1781.
Onagra parviflora Moench, Meth. 675. 1794.
Onagra muricata Moench, Meth. 675. 1794.
OEnothera gauroides Hornem. Hort. Hafn. 1: 362. 1813.
OEnothera pubescens Nees in Neuwied, Reise N. A. 2: 435.
Onagra Europaea Spach, Hist. Veg. 4: 359. 1835.
Onagra communis Spach, Hist. Veg. 4: 359. 1835.
Onagra chrysantha Spach, Hist. Veg. 4: 362. 1835.
Onagra vulgaris Spach, Nouv. Ann. Mus. Par. 4: 353. 1835.
OEnothera biennis var. *vulgaris* T. & G. Fl. N. A. 1: 492. 1840.
OEnothera biennis var. *muricata* T. & G. Fl. N. A. 1: 492. 1840.
OEnothera biennis var. *canescens* T. & G. Fl. N. A. 1: 492. 1840.
? *OEnothera Jepsonii* Greene, Fl. Francis. 211. 1891.

Throughout the United States, east of the Rocky Mountains, ranging from sea-level to about 650 meters on various mountains.

The geographic range of *O. biennis* is not as extensive as has been supposed. The species proper ranges westward only to the Mississippi River. In the area from the Mississippi River to the Rocky Mountains it is represented by a closely related form clothed with strigose pubescence; this form might be separated as a variety or even a species. As far as I can learn, it has not been found west of the Rocky Mountains. Prof. Greene described *OEnothera Jepsonii** from California, but later

* Fl. Francis. 211.

referred it to *O. biennis*,* a doubtful disposition unless the plant is introduced. I have not seen specimens of this form.

3a. ONAGRA BIENNIS GRANDIFLORA (Ait.) Lindl.

OEnothera grandiflora Ait. Hort. Kew. 2: 2. 1789.

OEnothera suaveolens Desf. Tab. 169. 1804.

OEnothera biennis var. *grandiflora* Lindl. Bot. Reg. 19. *pl. 1604.* 1833.

OEnothera Lamarkiana Ser. in DC. Prodr. 3: 47. 1828.

Range the same as the species, more common in the Southeast; introduced in the vicinity of San Francisco according to Prof. Greene.

4. ONAGRA OAKESIANA (A. Gray) Britton.

OEnothera biennis var. *Oakesiana* A. Gray, Man. Ed. 5, 178. 1867.

OEnothera Oakesiana Robbins; A. Gray, Man. Ed. 5, 178. As synonym. 1867.

Onagra Oakesiana Britton, Mem. Torr. Club, 5: 233. 1894.

Shores of the St. Lawrence, west to the Great Lake region, south to New York and Nebraska.

5. ONAGRA HOOKERI (T. & G.).

OEnothera Hookeri T. & G. Fl. N. A. 1: 493. 1840.

OEnothera biennis Torr. Emory Rep. 140. 1848. Not L.

? *OEnothera odorata* H. & A. Bot. Beech. Voy. 343. 1841.

OEnothera biennis var. *hirsutissima* A. Gray, Pl. Fendl. 43. 1848.

Western slopes of the Rocky Mountains, west to the Pacific; at 1800 meters in Utah.

It seems remarkable that this excellent species could be confounded with *O. biennis*. Its gross characters are so strong that a scrap or even a leaf is sufficient to separate it from related species. It does not range east of the Rocky Mountains and is the western homologue of the eastern *O. biennis*.

6. ONAGRA JAMESII (T. & G).

OEnothera Jamesii T. & G. Fl. N. A. 1: 493. 1840.

Southern Utah south to eastern Texas and eastern Arizona.

* Man. Bot. Bay Reg. 131.

7. ONAGRA MACROSCELES (A. Gray).

OEnothera macrosceles A. Gray, Pl. Fendl. 43. 1848.

Northern Mexico.

8. ONAGRA ARGUTA (Greene).

OEnothera arguta Greene, Fl. Francis, 212. 1891.

Southern California, from Monterey southward. I have not seen specimens of this plant.

2. OENOTHERA L. Sp. Pl. 340. 1753.

Flowers axillary.

Plants clothed with dense appressed or ascending pubescence.

Flowers 2–3 cm. broad; species of the Atlantic Coast. 1. *O. humifusa*

Flowers 7–9 cm. broad; species of the Western Gulf Coast. 2. *O. Drummondii.*

Plants glabrous or rarely clothed with spreading hairs. 3. *O. laciniata.*

Flowers in terminal leafy bracted spikes.

Spike few-flowered, loose; bracts ovate; calyx villous. 4. *O. heterophylla.*

Spike many-flowered, dense; bracts narrow; calyx silky. 5. *O. rhombipetala.*

1. OENOTHERA HUMIFUSA Nutt.

OEnothera humifusa Nutt. Gen. 1: 245. 1818.

OEnothera sinuata var. *humifusa* T. & G. Fl. N. A. 1: 494. 1840.

Drifting sand along the coast from New Jersey to Florida; ranges but little above sea-level.

2. OENOTHERA DRUMMONDII Hook.

OEnothera Drummondii Hook. Bot. Mag. *pl. 3361.* 1835.

? *OEnothera sinuata* var. *humifusa* A. Gray, Proc. Am. Acad. 5: 158. 1862.

Coast of Texas; ranges only a few meters above sea-level.

3. OENOTHERA LACINIATA Hill.

OEnothera laciniata Hill, Syst. Veg. 12: 64. 1767.

OEnothera sinuata L. Mant. 2: 228. 1771.

OEnothera repanda Medic. Act. Acad. Theod. Palat. 3: 198. *pl. 8.* 1775.

Onagra sinuata Moench, Meth. 676. 1794.

OEnothera prostrata Ruiz & Pavon, Fl. Per. 3: 79. *pl. 315.* 1802.

OEnothera minima Pursh, Fl. Am. Sept. 262. *pl. 15.* 1814.

OEnothera sinuata var. *minima* Nutt. Gen. 1: 245. 1818.

? *OEnothera longiflora* Scheele; S. Wats. Proc. Am. Acad. 8: 618 1873. Not Jacq.

New Jersey south to Florida, to Texas and Nebraska, also in central and northern South America.

3a. OENOTHERA LACINIATA MEXICANA (Spach).

OEnothera Mexicana Spach, Nouv. Ann. Mus. Par. 4: 347. 1835.

OEnothera sinuata var *hirsuta* T. & G. Fl. N. A. 1: 494. 1840.

Nebraska to Texas and Mexico.

3b. OENOTHERA LACINIATA OCCIDENTALIS.

OEnothera sinuata var. *grandiflora* S. Wats. Proc. Am. Acad. 8: 581. 1873. Not *OE. grandiflora* Ait. 1789.

?*OEnothera longiflora* Scheele; S. Wats. Proc. Am. Acad. 8: 618. 1873.

Missouri to Kansas, south to Texas.

4. OENOTHERA HETEROPHYLLA Spach.

OEnothera heterophylla Spach, Nouv. Ann. Mus. Par. 4: 348. 1835.

OEnothera bifrons Don, Sweet, Brit. Fl. Gard. (II.) *pl. 386.* 1831–1838.

OEnothera rhombipetala Engelm. & Gray, Bost. Journ. Nat. Hist 5: 216. 1847.

OEnothera Leona Buckley, Proc. Acad. Phila. 1861: 163. 1861.

Florida to Texas.

5. OENOTHERA RHOMBIPETALA Nutt.

OEnothera rhombipetala Nutt.; T. & G. Fl. N. A. 1: 493. 1840.

OEnothera Darlingtonii Pickering; S. Wats. Proc. Am. Acad. 8: 612. 1873.

Minnesota and Wisconsin, to Illinois, Nebraska and Indian Territory.

4. ANOGRA Spach, Ann. Sci. Nat. (II.) 4: 164. 1835.

Burmannia Spach, Hist. Veg. 4: 351. 1835. Not DC. 1833.

Tips of the calyx-segments not free in the bud.

Capsules divergent or reflexed.

Valves of the capsules not winged at the base.	1. *A. deltoidea.*
Valves of the capsules winged at the base.	2. *A. xylocarpa.*

Capsules more or less ascending.
Seeds narrow, smooth, sharply pointed. 3. *A. trichocalyx.*
Seeds ovoid, minutely ribbed and pitted, rather blunt. 4. *A. albicaulis.*
Tips of the calyx-segments free in the bud.
Throat of the calyx-tube villous within. 5. *A. coronopifolia.*
Throat of the calyx-tube glabrous within.
Calyx glabrous or rarely appressed pubescent.
Stem several centimeters long; leaves long-petioled. 6. *A simplex.*
Stem elongated; leaves short-petioled or sessile. 7. *A. pallida.*
Calyx villous.
Lower leaves oblanceolate or spatulate in outline. 8. *A. Californica.*
Lower leaves lanceolate or oblong in outline. 9. *A. Neo-Mexicana.*

1. ANOGRA DELTOIDEA (Torr & Frem.).

OEnothera deltoidea Torr. & Frem., Frem. Rep. 315. 1845.
Utah to California and Arizona.

2. ANOGRA XYLOCARPA (Coville).

OEnothera xylocarpa Coville, Cont. Nat. Herb. 4: 105. 1892.
Tulare County, California.

3. ANOGRA TRICHOCALYX (Nutt.).

OEnothera trichocalyx Nutt; T. & G. Fl. N. A. 1: 494. 1840.
Wyoming to California and New Mexico; ascends to 1950 meters in California.

4. ANOGRA ALBICAULIS (Pursh) Britton.

OEnothera albicaulis Pursh, Fl. Am. Sept. 733. 1814.
OEnothera pinnatifida Nutt. Gen. 1: 245. 1818.
OEnothera Purshiana Steud. Nom. 2: 207. 1841.
OEnothera Purshii Don, Gard. Dict. 2: 688. 1832.
Burmannia pinnatifida Spach, Hist. Veg. 4: 353. 1835.
Anogra pinnatifida Spach, Nouv. Ann. Mus. Par. 4: 341. 1835.
OEnothera coronopifolia A. Gray, Pl. Wright. 2: 56. 1853.
Anogra albicaulis Britton, Mem. Torr. Club, 5: 234. 1894.
South Dakota to the Rocky Mountains south to Indian Territory, New Mexico and Sonora, ascending to 1100 meters in the Black Hills.

5. ANOGRA CORONIPOFOLIA (T. & G.) Britton.

OEnothera coronipofolia T. & G. Fl. N. A. 1: 245. 1840.

OEnothera pinnatifida James, Bot. Long's Exp. 2: 154. 1825. Not Nutt. 1818.

South Dakota to Wyoming, south to Kansas, Utah and New Mexico.

6. ANOGRA SIMPLEX.

OEnothera ambigua S. Wats. Proc. Am. Acad. 14: 293. 1879. Not Spreng, 1825.

OEnothera albicaulis var. *decumbens* S. Wats. Proc. Am. Acad. 14: 293. 1879, as synonym. Not *OE. decumbens* Dougl.

Southern Utah and Northern Arizona.

7. ANOGRA PALLIDA (Lindl.) Britton.

OEnothera albicaulis Nutt. Fras. Cat. Name only. 1813.

OEnothera pallida Lindl. Bot. Reg. 14: *pl. 1142.* 1828.

OEnothera Nuttallii Sweet, Hort. Brit. Ed. 2, 199. 1830.

Baumannia Nuttalliana Spach, Hist. Veg. 4: 352. 1835.

Anogra Nuttalliana Spach, Nouv. Ann. Mus. Par. 4: 339, 1835.

Baumannia Douglasiana Spach, Hist. Veg. 4: 352. 1835.

Anogra Douglasiana Spach, Nouv. Ann. Mus. Par. 4: 339, 1835.

OEnothera pinnatifida var. *integrifolia* A. Gray, Pl. Fendl. 44. 1848.

OEnothera albicaulis var. *Nuttallii* Engelm. Am. Journ. Sci. (II.) 34: 334. 1862.

OEnothera leptophylla Nutt.; S. Wats. Proc. Am. Acad. 8: 602. 1873.

British Columbia to Washington and Minnesota south to Sonora; ascends to about about 1700 meters in the Black Hills.

7a. ANOGRA PALLIDA LATIFOLIA (Rydberg).

OEnothera pallida var. *latifolia* Rydberg, Cont. Nat. Herb. 3: 159. 1895.

Nebraska and Colorado.

7b. ANOGRA PALLIDA RUNCINATA (Engelm.).

OEnothera albicaulis var. *runcinata* Engelm. Am. Journ. Sci. (II.), 34: 334. 1862.

OEnothera pinnatifida A. Gray, Pl. Fendl. 43. In part. 1848. Not Nutt. 1818.

Utah to Arizona and Texas.

7c. ANOGRA PALLIDA BREVIFOLIA (Engelm.).

OEnothera albicaulis var. *brevifolia* Engelm. Am. Journ. Sci. (II.) **34**: 335. 1862.

Sand hills south of El Paso, Texas.

7d. ANOGRA PALLIDA ENGELMANNI.

OEnothera albicaulis var. *trichocalyx* Engelm. Am. Journ. Sci. (II.), **34**: 335. 1862. Not *O. trichocalyx*. Nutt. 1840.

Las Vegas, New Mexico.

8. ANOGRA CALIFORNICA (S. Wats.).

OEnothera albicaulis var. *Californica* S. Wats. Proc. Am. Acad. **8**: 582. 1873.

OEnothera Californica S. Wats. Bot. Calif. **1**: 223. 1876.

Central California to southern Utah and southward; ascends to 1900 meters in the San Bernardino Mountains.

9. ANOGRA NEO-MEXICANA n. sp.

OEnothera albicaulis var. A. Gray, Pl. Wright. **2**: 56. 1853.

Annual or perennial, stout, hispid-villous, dark green. Stem erect, 6–7 dm. tall, flexuous, somewhat branched, clothed with a pale papery bark; leaves oblong or lanceolate, 4–8 cm. long, obtuse or acute, sinuate-toothed or somewhat pinnatifid, puberulent, with some hispid-villous hairs on the mid-rib and lateral nerves, rather abruptly narrowed into a slender petiole which is less than one centimeter long; flowers few at the ends of the branches, 5–6 cm. broad; calyx hispid-villous, its tube stoutish, 4–4.5 cm. long; nearly thrice longer than the ovary, its segments nearly linear, one-half as long as the tube, the tips free in the bud; petals broadly obdeltoid, 1.8 cm. long, 2 cm. broad, somewhat emarginate, narrowed into a broad claw; filaments about one-half as long as the petals; anthers 1–1.2 cm. long; style slender, longer than the petals; capsule nearly cylindric, 2–2.5 cm. long, somewhat narrowed at the base and the apex, hispid-villous; seeds "oblong and perfectly smooth."

New Mexico. Wright, no. 1068.

A perfectly distinct species, related to *A. pallida*, but easily separated by its foliage and hispid-villous calyx.

4. KNEIFFIA Spach, Hist. Veg. 4: 373. 1835.

Stem-leaves linear-filiform; capsule 4-angled or slightly winged. 1. *K. linifolia*.
Stem-leaves never approaching filiform; capsules winged.

Capsules more or less club-shaped.
  Capsules pubescent.
    Stems decumbent, spreading; pedicels shorter than the body of the capsules. 2. *K. Alleni.*
    Stems erect or nearly so, not spreading.
      Pedicels longer than the body of the capsules.
        Body of the capsules subglobose; leaves numerous. 3. *K. subglobosa.*
        Body of the capsules obovoid, leaves few. 4. *K. longipedicellata.*
      Pedicels shorter than the body of the capsules.
        Capsules on slender pedicels, with thin wings. 5. *K. linearis.*
        Capsules on stout pedicels (sometimes nearly sessile) with thick wings. 6. *K. Spachiana.*
  Capsules glabrous or glabrate. 7. *K. pumila.*
Capsules oblong or nearly so.
  Plants not glaucous; capsules less than 1 cm. long. 8. *K. fruticosa.*
  Plants somewhat glaucous; capsules 1 cm. long. 9. *K. glauca.*

1. Kneiffia linifolia (Nutt.) Spach.

OEnothera linifolia Nutt. Journ. Acad. Phila. 2: 120. 1821.

Kneiffia linifolia Spach, Nouv. Ann. Mus. Par. 4: 368. 1835.

Kansas and Illinois to Texas and Georgia; ascends only a few meters above sea-level.

2. Kneiffia Alleni (Britton).

OEnothera fruticosa var. *humifusa* Allen, Bull. Torr. Club, 1: 3. 1870. Not *OE. humifusa* Nutt. 1818.

Kneiffia linearis Alleni Britton, Mem. Torr. Club, 5: 235. 1894.

Eastern end of Long Island, at sea-level.

This local form must be separated from the species with which it has been associated on account of its habit, flowers and capsule.

3. Kneiffia subglobosa n. sp.

Perennial, slender, puberulent, dull green, producing numerous stolons. Stem erect, 2–3 dm. tall, much branched, strict or slightly flexuous, red; basal leaves spatulate, 4–10 cm. long, obtuse or acutish, undulately toothed, gradually narrowed into a short petiole; stem leaves linear or nearly so, 2–7 cm. long, entire or distantly toothed, narrowed into a short petiole or sessile, slightly revolute; flowers in terminal racemes which are more or less corymbosely arranged, yellow, about 3 cm. broad; calyx villous or silky, its tube slender, 1 cm. long, about twice as long as the ovary, its segments linear, about as long as the tube and less pubescent, the tips free in the bud; petals obovate, 1.5 cm long, notched at the apex; filaments nearly one half as long as the petals;

style slender, two-thirds as long as the petals; stigmas filiform, 3–4 mm. long; capsule at length subglobose, or globose-obovoid, 6–7 mm. long, on a stalk which exceeds the body, the angles strongly winged, the faces strongly ridged; seeds very irregular, minutely papillose, black, 1 mm. long.

North Carolina and Georgia.

Most closely related to *K. Alleni* and part of Torrey and Gray's var. *β*. It differs especially in its erect habit, very different basal leaves and larger flowers.

4. KNEIFFIA LONGIPEDICELLATA n. sp.

Annual, slender, bright green, more or less puberulent, stem erect or assurgent, 4–7 dm. tall, red, slender, simple or sparingly branched above; basal-leaves spatulate or obovate-spatulate, 4–6 cm. long; stem-leaves few, linear-lanceolate, 3–9 cm. long, obtuse or acutish, entire, often somewhat undulate, narrowed into a short petiole; flowers yellow, subtended by leaf-like bracts in terminal racemes which are sometimes corymbosely arranged; calyx hirsute, its tube slender, 1-1.5 cm. long, its segments linear, longer than the tube, the tips free in the bud; petals obovate, 2 cm. long, many-nerved, emarginate, stamens less than one half as long as the petals; styles slender, two-thirds as long as the petals; capsule narrowly obovoid, 1 cm. long, its angles winged, its faces ridged, on pedicels longer than the body; seeds irregularly oblong, .8 mm. long, brown, minutely papillose.

West Virginia to North Carolina and Florida.

Between *K. subglobosa* and *K. linearis*. It differs from the former in its sparsely leafy, usually nearly simple stem, the hirsute calyx, the larger flowers and the narrowly obovoid capsules. It can easily be separated from *K. linearis* by its pedicel, which exceeds the body of the capsule.

5. KNEIFFIA LINEARIS (Michx.) Spach.

OEnothera linearis Michx. Fl. Bor. Am. 1: 225. 1803.

?OEnothera media Link, Enum. Hort. Berol. 1: 377. 1821. acc. to S. Wats.

OEnothera riparia Nutt. Gen. 1: 247. 1818.

?OEnagra Linkiana Spach, Nouv. Ann. Mus. Par. 4: 354. 1835.

OEnothera fruticosa var. *linearifolia* Hook. Bot. Mag. *pl. 3545*. 1837.

Kneiffia linearis Spach, Hist. Veg. 4: 376. 1835.

Kneiffiia angustifolia Spach, Nouv. Ann. Mus. Par. 4: 368. 1835.

?Kneiffia maculata Spach, Hist. Veg. 4: 375. 1835.

OEnothera fruticosa var. *linearis* S. Wats. Proc. Am. Acad. 8: 584. 1873.

Connecticut to Tennessee, south to Georgia.

6. KNEIFFIA SPACHIANA (T. & G.).

OEnothera Spachiana T. & G. Fl. N. A. 1: 498. 1840.

Blennoderma Drummondii Spach, Nouv. Ann. Mus. Par. 4: 408. 1835.

OEnothera Drummondii Walp. Rep. 2: 85. 1843. Not Hook.

OEnothera uncinata Scheele, Linnaea, 21: 578. 1848.

Texas and Louisiana; ascends only a few feet above sea-level.

7. KNEIFFIA PUMILA (L.) Spach.

OEnothera pumila L. Sp. Pl. Ed. 2, 493. 1762.

OEnothera pusilla Michx. Fl. Bor. Am. 1: 225. 1803.

OEnothera chrysantha Michx. Fl. Bor. Am. 1: 225. 1803.

OEnothera gracilis Schrad.; F. & M. Ind. Sem. Hort. Petrop. 2: 44. 1835.

OEnothera riparia Lehm.; Hook. Fl. Bor. Am. 1: 212. 1830, not Nutt.

Kneiffia pumila Spach, Hist. Veg. 4: 377. 1835.

Kneiffia chrysantha Spach, Hist. Veg. 4: 377. 1835.

Nova Scotia to the Saskatchewan south to Georgia.

8. KNEIFFIA FRUTICOSA (L.) Raimann.

OEnothera fruticosa L. Sp. Pl. 346. 1753.

OEnothera mollissima Walt. Fl. Car. 129. 1788.

OEnothera hybrida Michx. Fl. Bor. Am. 1: 225. 1803.

OEnothera tetragona Roth, Cat. Bot. 2: 39. 1825.

OEnothera Canadensis Goldie, Edinb. Phil. Journ. 6: 325. 1822.

OEnothera incana Nutt. Gen. 1: 247. 1818.

OEnothera serotina Don; Sweet, Brit. Fl. Gard. 2: *pl. 184* 1825–1827.

Kneiffia suffruticosa Spach, Nouv. Ann. Mus. Par. 4: 365. 1835.

OEnothera fruticosa var. *differta* Millsp. Fl. W. Va. 366. 1892.

Kneiffia fruticosa Raimann, in Engl. & Prantl. Nat. Pfl. Fam. 3: Abt. 7, 214. 1893.

Nova Scotia to Missouri and southward.

8a. KNEIFFIA FRUTICOSA PILOSELLA (Raf.) Britton.

OEnothera Pilosella Raf. Ann. Nat. 15. 1820.

? OEnothera fruticosa var. *ambigua* Nutt. Gen. 1: 247. 1818.

? OEnothera ambigua Spreng. Syst. 2: 229. 1825.

Kneiffia floribunda Spach, Nouv. Ann. Mus. Par. 4: 366. 1835.

OEnothera fruticosa var. *hirsuta* Nutt.; T. & G. Fl. N. A. 1: 496. 1840.

Kneiffia fruticosa Pilosella Britton, Mem. Torr. Club, 5: 234. 1894.

9. KNEIFFIA GLAUCA (Michx.) Spach.

OEnothera glauca Michx. Fl. Bor. Am. 1: 224. 1803.

Kneiffia glauca Spach, Hist. Veg. 4: 374. 1835

OEnothara Fraseri Pursh, Fl. Am. Sept. 734. 1814.

OEnothera glauca var. *Fraseri* T. & G. Fl. N. A. 1: 497. 1840.

OEnothera fruticosa var. *Fraseri* Hook. Bot. Mag. *pl. 3548*. 1837.

Kneiffia Fraseri Spach, Hist. Veg. 4: 375. 1835.

Virginia and Kentucky, south to Georgia and Alabama, ascends to 1600 meters on Roan. Mt., Tenn.

5. HARTMANNIA Spach, Hist. Veg. 4: 370. 1835.

[XYLOPLEURUM Spach, Hist. Veg. 4: 378. 1835.]

Plants canescent (except some forms of *H. rosea parviflora*).

Calyx-tube shorter than the ovary; capsule club-shaped. 1. *H. rosea.*

Calyx-tube longer than the ovary; capsule oblong or elliptic. 2. *H. speciosa.*

Plants more or less villous. 3. *H. tetraptera.*

1. HARTMANNIA ROSEA (Ait.) Don.

OEnothera rosea Ait. Hort. Kew. 2: 3. 1789.

OEnothera rubra Cav. Ic. 4: 68. *pl. 400*. 1797.

OEnothera purpurea Lam. Encycl. 4: 554. 1797.

Hartmannia rosea Don, in Sweet, Hort. Brit. Ed. 3, 236. 1. 839.

Hartmannia gauroides Spach, Hist. Veg. 4: 371. 1835.

Xylopleurum roseum Raimann, in Engl. & Prantl, Nat. Pfl. Fam. 3: Abt. 7, 214. 1893.

Texas to New Mexico and southward; also in western South America.

1a. HARTMANNIA ROSEA PARVIFOLIA (Coult.).

OEnothera rosea var. *parvifolia* Coult. Cont. Nat. Herb. 2: 186. 1891.

Texas and northern Mexico.

2. HARTMANNIA SPECIOSA (Nutt.).

OEnothera speciosa Nutt. Journ. Acad. Phila. 2: 119. 1821.

Xylopleurum hirsutum Spach, Nouv. Ann. Mus. Par. 4: 370. 1835.

Xylopleurum Nuttallii Spach, Nouv. Ann. Mus. Par. 4: 371. 1835.

Xylopleurum Drummondii Spach, Nouv. Ann. Mus. Par. 4: 371. 1835.

Xylopleurum obtusifolium Spach, Nouv. Ann. Mus. Par. 4: 372. 1835.

OEnothera Spachii Dietr. Syn. 2: 1289. 1840.

OEnothera obtusifolia Dietr. Syn. 2: 1289. 1840.

OEnothera Drummondii Schnitzlein, Ic. *pl. 265. f. 1.*

Xylopleurum speciosum Raimann, in Eng. & Prantl, Nat. Pfl. Fam. 3: Abt. 7, 214. 1893.

Missouri to Kansas, south to Texas and Mexico; introduced into fields around Charleston, S. C.

3. HARTMANNIA TETRAPTERA (Cav.).

OEnothera tetraptera Cav. Ic. 3: 40. *pl. 279.* 1794.

Texas, Mexico, Central America and northern South America.

6. PACHYLOPHUS Spach, Hist. Veg. 4: 365. 1835.

PACHYLOPHUS CAESPITOSA (Nutt.) Raimann.

OEnothera caespitosa Nutt. Fras. Cat. 1813.

OEnothera scapigera Pursh, Fl. Am. Sept. 263. 1814.

Pachylophus Nuttallii Spach, Hist. Veg. 4: 365. 1835.

Pachylophus Nuttalliana Spach, Nouv. Ann. Mus. Par. 4: 356. 1835.

OEnothera montana Nutt.; T. & G. Fl. N. A. 1: 500. 1840.

OEnothera marginata Nutt.; Hook. & Arn. Bot. Beech. 342. 1841.

OEnothera eximia A. Gray, Pl. Fendl. 45. 1848.

Pachylophis caespitosa Raimann, in Eng. & Prantl, Nat. Pfl. Fam. 3: Abt. 7, 215. 1893.

Dakota to Idaho, south to California, New Mexico and Senora.

7. LAVAUXIA Spach, Hist. Veg. 4: 366. 1835.

Tips of the calyx-segments not free in the bud. 1. *L. primiveris.*
Tips of the calyx-segments free in the bud.
Leaves thinnish, very conspicuously pinnatifid. 2. *L. triloba.*
Leaves thick, entire or sparingly pinnatifid near the base.
Capsule ovoid or elliptic; testa of the seed thickened. 3. *L. brachycarpa.*
Capsule attenuate at the apex; testa of the seed not thickened. 4. *L. Wrightii.*

1. LAVAUXIA PRIMIVERIS (A. Gray).

OEnothera primiveris A. Gray, Pl. Wright. 2: 58. 1853.

Texas and New Mexico.

2. LAVAUXIA TRILOBA (Nutt.) Spach.

OEnothera triloba Nutt. Journ. Acad. Phila. 2: 118. 1821.

OEnothera rhizocarpa Spreng. Syst. 2: 239. 1825.

Lavauxia triloba Spach, Hist. Veg. 4: 367. 1835.

Lavauxia Nuttalliana Spach, Nouv. Ann. Mus. Par. 4: 358. 1835.

OEnothera Roemeriana Scheele, Linnaea, 22: 154. 1849.

OEnothera clandestina Nutt.; S. Wats. Proc. Am. Acad. 8: 615. 1873.

Saskatchewan to Texas, California and Sonora.

2a. LAVAUXIA TRILOBA WATSONI Britton.

OEnothera triloba (?) var. *parviflora* S. Wats. Proc. Am. Acad. 12: 251. 1876. Not *O. parviflora* L.

Lavauxia triloba Watsoni Britton, Mem. Torr. Club, 5: 235. 1894.

Kansas and Nebraska.

3. LAVAUXIA BRACHYCARPA (A. Gray) Britton.

OEnothera brachycarpa A. Gray, Pl. Wright. 1: 70. 1852.

OEnothera marginata var. *purpurea* S. Wats. Bot. King's Rep. 5: 108. 1871.

Lavauxia brachycarpa Britton, Mem. Torr. Club, 5: 235. 1894.

Western Texas and New Mexico, probably in Nevada and Montana.

4. LAVAUXIA WRIGHTII (A. Gray).

OEnothera Wrightii A. Gray, Pl. Wright. 2: 57. 1853.

New Mexico.

8. GAURELLA.

Perennial herbs low, wiry, diffuse, canescent or strigilose. Stems at length branched throughout and spreading, leafy, clothed with a longitudinally wrinkled bark; leaves small, linear-lanceolate or lanceolate, nearly entire or distantly toothed, narrowed into a very short petiole; flowers axillary, white or rose-colored, spotted or striped with red; calyx purplish, its tube cylindric, slightly dilated at the throat, twice as long as the ovary, its segments slightly longer than the tube; their tips not free in the bud; petals obovate, truncate or emarginate; filaments filiform-subulate; anthers linear; ovary sessile, 4-angled; style stoutish, enlarged at the top; stigmas filiform; capsule ovoid-pyramidal, sessile, attenuate into a slender curved beak, the angles keeled, the faces swollen; seeds obovoid, angled, pointed at the base; delicately striate.

A perfectly distinct genus, with no very close affinity to related groups. It differs from *Megapterium*, with which it has been associated, in habit, foliage, inflorescence and fruit.

1. GAURELLA GUTTULATA (Geyer).

OEnothera canescens Torr. & Frem., Frem. Rep. 315. 1845. Not *OE. biennis* var. *canescens* T. & G. 1840.

OEnothera guttulata Geyer; Hook. Lond. Journ. Bot. 6: 222. 1847.

Megapterium canescens Britton, Mem. Torr. Club, 5: 235. 1894.

Wyoming to Kansas and New Mexico.

9. MEGAPTERIUM Spach, Hist. Veg. 4: 363. 1835.

Leaves entire or nearly so.	
Capsule (with wings) oblong, 2–3 cm. long.	1. *M. Fremontii.*
Capsule (with wings) suborbicular, 5–6 cm. long.	2. *M. Missouriense.*
Leaves pinnatifid.	3. *M. dissectum.*

1. MEGAPTERIUM FREMONTII (S. Wats.) Britton.

OEnothera Fremontii S. Wats. Proc. Am. Acad. 8: 587. 1873.

Megapterium Fremontii Britton, Mem. Torr. Club, 5: 286. 1893.

Kansas to Texas.

2. MEGAPTERIUM MISSOURIENSE (Sims) Spach.

OEnothera Missouriensis Sims, Bot. Mag. *pl. 1592.* 1814.
OEnothera macroparpa Pursh, Fl. Am. Sept. 374. 1814.
OEnothera alata Nutt. Gen. 1: 248. 1818.
Megapterium Missouriense Spach, Hist. Veg. 4: 364. 1835.
Megapterium Nuttallianum Spach, Hist. Veg. 4: 363. 1835.
OEnothera Drummondii Hook. Lond. Journ. Bot. 6: 221. 1847.
OEnothera Missouriensis var. *latifolia* A. Gray, Bost. Journ. Nat. Hist. 5: 188. 1856.
OEnothera Missouriensis var. *incana* A. Gray, Bost. Journ. Nat. Hist. 5: 189. 1856.
Nebraska to Texas.

3. MEGAPTERIUM DISSECTUM (A. Gray).

OEnothera dissecta A. Gray, Proc. Am. Acad. 17: 356. 1882.
OEnothera Havardi S. Wats. Proc. Am. Acad. 20: 366. 1885.
Western Texas and northern Mexico.

10. TARAXIA Nutt.; Raimann in Engl. and Prantl, Nat. Pfl. Fam. 3: Abt. 7, 216. 1893.

Leaves not pinnatifid.
Plants hirsute.
Plants acaulescent. 1. *T. graciliflora.*
Plants producing several short branches. 2. *T. Palmeri.*
Plants glabrous or glabrate; leaves lanceolate or linear.
Leaves lanceolate; calyx-segments linear-lanceolate. 3. *T. heteranthera.*
Leaves ovate; calyx-segments lanceolate. 4. *T. ovata.*
Leaves pinnatifid.
Sparingly pubescent; calyx-tube longer than the segments; seeds minutely pitted in rows. 5. *T. breviflora.*
Densely pubescent; calyx-tube several times longer than the segments; seeds conspicuously pitted. 6. *T. longiflora.*

1. TARAXIA GRACILIFLORA (H. & A.) Raimann.

OEnothera graciliflora H. & A. Bot. Beech. Voy. 341. 1841.
Taraxia graciliflora Raimann, in Engl. & Prantl, Nat. Pfl. Fam. 3: abt. 7, 217. 1893.
California except the extreme north; apparently also in Colorado.

2. TARAXIA PALMERI (S. Wats.).

OEnothera Palmeri S. Wats. Proc. Am. Acad. 12: 251. 1877.
Valleys, Arizona and southern California.

3. TARAXIA HETERANTHA (Nutt.).

OEnothera heterantha Nutt. Journ. Acad. Phila. 7: 22. 1834.
Jussiaea subacaulis Pursh, Fl. Am. Sept. 304. 1814.
OEnothera triloba Hook. Lond. Journ. Bot. 6: 223. 1847. Not Nutt. 1821.

Idaho and Oregon to Utah and Nevada; at about 2200 meters in Utah.

3a. TARAXIA HETERANTHA TARAXACIFOLIA (S. Wats.).

OEnothera heterantha var. *taraxacifolia* S. Wats. Proc. Am. Acad. 8: 589. 1873.

On the Sierra Nevada.

4. TARAXIA OVATA (Nutt.).

OEnothera ovata Nutt.; T. & G. Fl. N. A. 1: 507. 1840.

California from San Francisco to Monterey.

5. TARAXIA BREVIFLORA (T. & G.) Nutt.

OEnothera breviflora T. & G. Fl. N. A. 1: 506. 1840.
OEnothera Nuttallii Torr. & Frem., Frem. Rep. 89. 1845.
Taraxia breviflora Nutt.; T. & G. Fl. N. A. 1: 506. 1840.

Northwest Territory to Colorado and Utah, where it ascends to about 2800 meters.

6. TARAXIA LONGIFLORA Nutt.

OEnothera Nuttallii T. & G. Fl. N. A. 1: 506. 1840. Not Sweet. 1830.
OEnothera tanacetifolia T. & G. Pacif. R. R. Rep. 2: 121. *pl. 4*, 1854.
Taraxia longiflora Nutt.; T. & G. Fl. N. A. 1: 506. As synonym. 1840.

Washington to Nevada and California.

11. GALPINSIA Britton, Mem. Torr. Club, 5: 263. 1894.

[SALPINGIA Raimann in Engl. & Prantl, Nat. Pfl. Fam. 3: Abt. 7, 217. 1893. Not *Salpinga* DC.]

Free tips of the calyx-segments about 3 mm. long. 1. *G. Hartwegii.*
Free tips of the calyx-segments less than 2 mm. long.
Plants hispid; calyx-tube much longer than the ovary. 2. *G. Greggii.*
Plants puberulent; calyx-tube slightly longer than the ovary. 3. *G. tubicula.*

1. GALPINSIA HARTWEGI (Benth.) Britton.

OEnothera Hartwegi Benth. Pl. Hartw. 5. 1839.

OEnothera lavandulaefolia T & G. Fl. N. A. 1: 501. 1840.

OEnothera Hartwegi var. *lavandulaefolia* S. Wats. Proc. Am. Acad. 8: 590. 1873.

Salpingia Hartwegi Raimann, in Engl. & Prantl, Nat. Pfl. Fam. 3: Abt. 7, 217. 1893.

Galpinsia Hartwegi Britton, Mem. Torr. Club, 5: 236. 1894.

Kansas to Colorado and Mexico.

1*a*. GALPINSIA HARTWEGI FENDLERI (A. Gray).

OEnothera Fendleri A. Gray, Pl. Fendl. 45. 1848.

OEnothera Hartwegi var. *Fendleri* A. Gray, Pl. Wright. 2: 56. 1853.

Nebraska to Indian Territory, Texas and New Mexico.

2. GALPINSIA GREGGII (A. Gray).

OEnothera Greggii A. Gray, Pl. Fendl. 46. 1848.

OEnothera Lampsana Buckl. Proc. Acad. Phila. **1861**: 454. 1861.

OEnothera Hartwegi var. A. Gray, Proc. Acad. Phila. **1862**: 163. 1862.

New Mexico and northern Mexico.

3. GALPINSIA TUBICULA (A. Gray).

OEnothera tubicula A. Gray, Pl. Wright. 1: 71. 1852.

OEnothera tubicula var. *demissa* A. Gray, Pl. Wright. 1: 71, 1852.

Northwestern Texas and New Mexico.

12. MERIOLIX Raf. Am. Month. Mag. 4: 192. 1881.

[CALYLOPHIS Spach, Hist. Veg. 4: 350. 1835.]

1. MERIOLIX SERRULATA (Nutt.) Walp.

OEnothera serrulata Nutt. Gen. 1: 246. 1818.

Calylophis Nuttallii Spach, Hist. Veg. 4: 350, 1835.

OEnothera fruticosa A. Gray, Pl. Fendl. 44. 1848.

OEnothera leucocarpa Comien; Lehm. in Hook. Fl. Bor. Am. 1: 210. 1833.

OEnothera serrulata var. *Douglassi* T. & G. Fl. Bor. Am. 1: 502. 1840.

OEnothera serrulata var. *Drummondii* T. & G. Fl. N. A. 1: 502. 1840.

Calylophis Drummondiana Spach, Nouv. Ann. Mus. Par. 4: 337. 1835.

? Calylophis Berlandieri Spach, Nouv. Ann. Mus. Par. 4: 337. 1835.

Meriolix serrulata Walp. Repert. 2: 79. 1843.

Meriolix Berlandieri Walp. Repert. 2: 79. 1843.

OEnothera spinulosa var. *Drummondii* Engelm. Pl. Upp. Miss. 192. Acc. to S. Wats.

Saskatchewan to Missouri, Texas and Arizona.

1a. MERIOLIX SERRULATA SPINULOSA (T. & G.).

OEnothera serrulata Nutt. Journ. Acad. Phila. 2: 120. 1821.

OEnothera serrulata var. *spinulosa* T. & G. Fl. N. A. 1: 502. 1840.

Saskatchewan to Missouri and Texas.

1b. MERIOLIX SERRULATA PINIFOLIA (Engelm.).

OEnothera serrulata var. *pinifolia* Engelm. Bost. Jour. Nat. Hist. 5: 189. 1856.

? OEnothera capillifolia Scheele, Linnaea, 21: 576. 1848.

Texas.

13. EULOBUS Nutt.; T. & G. Fl. N. A. 1: 514. 1840.

1. EULOBUS CALIFORNICUS Nutt.; T. & G. Fl. N. A. 1: 515. 1840.

Eulobus Californicus Nutt.; T. & G. Fl. N. A. 1: 515. 1840.

OEnothera Californica Greene, Pitt. 1: 290. 1889, not S. Wats. 1876.

OEnothera leptocarpa Greene, Pitt. 1: 302. 1889.

Southern California.

14. SPHAEROSTIGMA F. & M. Ind. Sem. Hort. Petrop. 2: 49. 1835.

[CHAMISSONIA Link, Jahrb. der Gewächsk. 186. 1818. Not *Chamissoa* H. B. K.]

[AGASSIZIA Spach, Hist. Veg. 4: 346. 1835.]

[HOLOSTIGMA Spach, Nouv. Ann. Mus. Per. 4: 21. 1835.]

Flowers yellow, turning red or green.
- Capsules fusiform, straight.
  - Seeds cylindric-oblong. 1. *S. aldinum.*
  - Seeds clavate. 2. *S. Hilgardi.*
- Capsules linear, somewhat curved.
  - Plants puberulent or hirsute.
    - Capsules scarcely beaked. 3. *S. contortum.*
    - Capsules with a slender beak. 4. *S. campestre.*
  - Plants viscid-glandular. 5. *S. chamaenerioides.*
- Capsules linear or linear-fusiform, more or less contorted.
  - Flowers less than 1 cm. broad.
    - Lower stem-leaves linear or nearly so; species maritime. 6. *S. micranthum.*
    - Lower stem-leaves ovate; species not maritime. 7. *S. hirtellum.*
  - Flowers more than 1 cm. broad.
    - Plant glabrous and lustrous. 8. *S. nitidum.*
    - Plants pubescent and dull.
      - Stems woody; leaves sessile. 9. *S. viridescens.*
      - Stems herbaceous; lower stem-leaves petioled.
        - Calyx canescent. 10. *S. spirale.*
        - Calyx hirsute.
          - Capsule with a very short beak. 11. *S. Bistorta.*
          - Capsule with a long slender beak. 12. *S. Veitchianum.*

Flowers white or rose-colored; capsules terete or nearly so.
- Plants glabrous (inflorescence glabrate); capsules enlarged at the base. 13. *S. decorticans*
- Plants pubescent or glandular.
  - Capsules enlarged at the base, viscid-glandular. 14. *S. Boothii.*
  - Capsules scarcely enlarged at the base.
    - Plants more or less villous. 15. *S. Utahense.*
    - Plants more or less puberulent.
      - Leaves linear or nearly so. 16. *S. refractum.*
      - Leaves spatulate, elliptic or lanceolate. 17. *S. alyssoides.*

1. SPHAEROSTIGMA ANDINUM (Nutt.) Walp.

OEnothera andina Nutt.; T. & G. Fl. N. A. 1: 512. 1840.

Sphaerostigma andinum Walp. Repert. 2: 79. 1843.

Washington to Montana, south to Nevada and Utah; at 1800 meters in Utah and Nevada.

2. SPHAEROSTIGMA HILGARDI (Greene).

OEnothera Hilgardi Greene, Bull. Torr. Club, 10: 41. 1883.

Washington and Oregon.

3. SPHAEROSTIGMA CONTORTUM (Dougl.) Walp.

OEnothera contorta Dougl.; Lehm. in Hook. Fl. Bor. Am. 1: 214. 1833.

OEnothera strigulosa T. & G. Fl. N. A. 1: 512. 1840.

OEnothera parvula Nutt.; T. & G. Fl. N. A. 1: 511. 1840.

Sphaerostigma contortum Walp. Repert. 2: 78. 1843.

Sphaerostigma parvulum Walp. Repert. 2: 78. 1843.

Sphaerostigma strigulosum F. & M. Ind. Sem. Hort. Petrop. 2: 22. 1835.

Washington to Nevada, Arizona and southern California, where it ascends to 1850 meters.

3a. SPHAEROSTIGMA CONTORTUM PUBENS (S. Wats.).

OEnothera strigulosa var. *pubens* S. Wats. Proc. Am. Acad. 8: 594. 1873.

OEnothera contorta pubens Coville, Cont. Nat. Herb. 4: 104. 1893.

Vancouver Island to Nevada, Arizona and Southern California, ascends to 1500–1700 metres in Nevada and California.

3b. SPHAEROSTIGMA CONTORTUM GREENEI.

OEnothera strigulosa var. *epilobioides* Greene, Fl. Francis, 216. 1891. Not *OE. epilobioides* Nutt. 1840.

Away from the seaboard, from Oregon to San Diego, Cal.

4. SPHAEROSTIGMA CAMPESTRE (Greene).

OEnothera dentata S. Wats. Bot. Calif. 1: 226. 1876. Not Cav. Ic. 4: 67. *pl.* 398. 1797.

OEnothera campestris Greene, Fl. Francis, 216. 1891.

From the Valley of the Sacramento to southern California, where it ascends to 1700 meters.

4a. SPHAEROSTIGMA CAMPESTRE MINOR.

OEnothera strigulosa Benth. Pl. Hartw. 310. 1849.

OEnothera dentata var. *cruciata* S. Wats. Proc. Am. Acad. 8: 594. 1873. Not *OE. cruciata* Nutt. 1828.

5. SPHAEROSTIGMA CHAMAENERIOIDES (A. Gray).

OEnothera chamaenerioides A. Gray, Pl. Wright 2: 58. 1853.

Southern Utah to Texas and southern California.

6. SPHAEROSTIGMA MICRANTHUM (Hornem.) Walp.

OEnothera micrantha Hornem. "Hort. Hafn." 1807.

OEnothera dentata Ser. in DC. Prodr. 3: 46. In part. 1821, not Cav.

OEnothera hirta Link, Enum. 1: 378. 1821.

Sphaerostigma hirta F. & M. Ind. Sem. Hort. Petrop. 2: 22. 1835.

Holostigma micrantha Spach, Nouv. Ann. Mus. Par. 4: 334. 1835.

Sphaerostigma micranthum Walp. Repert. 2: 77. 1843.

OEnothera asperifolia Nutt.; S. Wats. Proc. Am. Acad. 8: 680. 1873.

OEnothera cheiranthifolia Torr. Pacif. R. R. Rep. 4: 87. 1857.

OEnothera strigulosa Torr. Pacif. R. R. Rep. 4: 87. 1857.

OEnothera bistorta A. Gray, Proc. Bost. Soc. Nat. Hist. 7: 146. 1859.

From the valley of the Sacramento south to Lower California,

7. SPHAEROSTIGMA HIRTELLUM (Greene).

OEnothera hirtella Greene, Fl. Francis. 215. 1891.

Mountains, from Lake county, California, southward.

8. SPHAEROSTIGMA NITIDUM (Greene).

OEnothera nitida Greene, Pitt. 1: 70. 1887.

Vicinity of Monterey Bay, California and on the Island of San Miguel.

9. SPHAEROSTIGMA VIRIDESCENS (Lehm.) Walp.

OEnothera viridescens Lehm. in Hook. Fl. Bor. Am. 1: 214. 1833.

Sphaerostigma viridescens Walp. Repert 2: 77. 1843.

Along the coast from Monterey Bay to San Diego.

10. SPHAEROSTIGMA SPIRALE (Lehm.) Walp.

OEnothera spiralis Lehm. in Hook. Fl. Bor. Am. 1: 213. 1833.

Along or near the coast from San Francisco southward.

11. SPHAEROSTIGMA BISTORTA (Nutt.) Walp.

OEnothera bistorta Nutt.; T. & G. Fl. N. A. 1: 508. 1840.

?*Holostigma Bottae* Spach, Nouv. Ann. Mus. Par. 4: 335. 1835.

Sphaerostigma bistortum Walp. Repert. 2: 77. 1843.
OEnothera cheiranthifolia A. Gray. Ives, Rep. 12. 18.
Southern California.

12. SPHAEROSTIGMA VEITCHIANUM (Hook).

OEnothera bistorta (?) var. *Veitchiana* Hook. Bot. Mag. *pl. 5078.*
OEnothera graciliflora Torr. Pacif. R. R. Rep. 4: 87. 1857.
Southern California to Lower California.

13. SPHAEROSTIGMA DECORTICANS (H. & A.).

Gaura decorticans H. & A. Bot. Beech. Voy. 343. 1840.
OEnothera gauraeflora T. &. G. Fl. N. A. 1: 510. 1840.
Sphaerostigma gauraeflorum Walp. Repert. 2: 78. 1843.
OEnothera Nevadensis Kellogg, Proc. Calif. Acad. 2: 224. *pl. 70.* 1863.
Southern Utah to Arizona and California; ascends to 2100 meters in California.

14. SPHAEROSTIGMA BOOTHII (Dougl.) Walp.

OEnothera Boothii Dougl.; Lehm. in Hook. Fl. Bor. Am. 1: 213. 1833.
OEnothera pygmaea Dougl.; Lehm. in Hook. Fl. Bor. Am. 1: 213. 1833.
OEnothera lithospermoides Nutt.; S. Wats. Proc. Am. Acad. 8: 604. 1873.
Sphaerostigma Boothii Walp. Repert. 2: 77. 1843.
Washington to California and Nevada; occurs at about 1000–1100 meters in Nevada.

15. SPHAEROSTIGMA UTAHENSE n. sp.

Annual, low, pale-green, villous. Stem erect, 2–10 cm. tall, simple or branched at the base or above, the branches ascending; leaves varying from spatulate to ovate, 1–2.5 cm. long, densely villous, obtuse or acutish, entire or obscurely toothed, narrowed into slender petioles; flowers yellow, 8–12 mm. broad, in loose terminal spikes; buds ovoid, 5 mm. long; calyx-tube very slender, 7–9 mm. long, shorter than the ovary, abruptly dilated at the throat; calyx-segments ovate or lanceolate, nearly twice shorter than the tube, involute, acutish; petals obovate, 3–5 mm. long, delicately nerved, crisped at the apex; style slender, exceeding

the stamens; capsules nearly filiform, about 1.5 cm. long, villous, spirally twisted near the base, slightly glandular; seeds oblong, 1 3 mm. long, pale, very minutely striate.

A species of low habit, related to *S. gauraeflorum*, *S. Boothii* and *S. refractum*, striking on account of its dense villous pubescence.

Specimens were collected on May 3, 1850, by Capt. Stansbury, at "Great Salt Lake, growing in loose sand on the 'storm line' of the shore," and by M. E. Jones, in June, 1880; these were distributed as *OEnothera Boothii* Dougl.

16. SPHAEROSTIGMA REFRACTUM (S. Wats.).

OEnothera refracta S. Wats. Proc. Am. Acad. 17: 373. 1882.
Southern Utah and northern Arizona.

17. SPHAEROSTIGMA ALYSSOIDES (H. & A.) Walp.

OEnothera alyssoides H. & A. Bot. Beech. Voy. 340. 1840.
Sphaerostigma alyssoides Walp. Repert. 2: 78. 1843.
Idaho and Oregon, south to Nevada, Utah and southern California; at 1100 meters in Nevada and California.

17a. SPHAEROSTIGMA ALYSSOIDES MINUTIFLORUM (S. Wats.).

OEnothera alyssoides var. *minutiflora* S. Wats. Proc. Am. Acad. 8: 591. 1873.
Northern Nevada and Utah.

17b. SPHAEROSTIGMA ALYSSOIDES MACROPHYLLA.

OEnothera alyssoides var. *villosa* S. Wats. Proc. Am. Acad. 8: 591. 1873. Not *OE. villosa* Thunb. 1794–1800.
Nevada and Utah.

OEnothera rutila Davidson, is said to belong to the genus SPHAEROSTIGMA, but I have not seen specimens.

15. CHYLISMA Nutt.; Raimann in Engl. & Prantl, Nat. Pfl. Fam. 3: Abt. 7, 217. 1893.

Flowers axillary, subtended by leaves. 1. *C. pterosperma.*
Flowers in terminal racemes, usually subtended by bracts.
Plants caulescent.
Leaves simple.
Leaves cordate; capsules short-pedicelled. 2. *C. cardiophylla.*
Leaves narrowed at the base; capsules long-pedicelled.

Plants villous; blade of leaf closely toothed.	3. *C. heterochroma.*
Plants hirsute; blade of leaf distantly toothed.	4. *C. Parryi.*
Leaves compound.	5. *C. multijuga.*
Plants scapose.	
Tips of the calyx-segments not free.	6. *C. scapoidea.*
Tips of the calyx-segments free.	7. *C. brevipes.*

1. CHYLISMA PTEROSPERMA (S. Wats.).

OEnothera pterosperma S. Wats. Bot. King, Rep. **5**: 112. *pl. 14.* 1871.

Northwestern Nevada and Utah; occurs at about 1280 meters in Nevada.

2. CHYLISMA CARDIOPHYLLA (Torr.).

OEnothera cardiophylla Torr. Pacif. R. R. Rep. **5**: 360. 1856.

Southern California to Arizona and Lower California; ascends to 700 meters in California.

3. CHYLISMA HETEROCHROMA (S. Wats.).

OEnothera heterochroma S. Wats. Proc. Am. Acad. **17**: 373. 1882.

Western Nevada.

4. CHYLISMA PARRYI (S. Wats.).

OEnothera Parryi S. Wats. Parry, Am. Nat. **9**: 20. 1877.

Southern Utah and northern Arizona.

5. CHYLISMA MULTIJUGA (S. Wats.).

OEnothera multijuga S. Wats. Proc. Am. Acad. **8**: 595. 1873.

Southern Utah.

6. CHYLISMA SCAPOIDEA (Nutt.).

OEnothera scapoidea Nutt.; T. & G. Fl. N. A. **1**: 506. 1840.

Wyoming and Idaho to Utah and southern California; occurs at about 1280 meters in Utah.

6a. CHYLISMA SCAPOIDEA CRUCIFORMIS (Kellogg).

OEnothera clavaeformis T. & G. Pacif. R. R. Rep. **2**: 121. 1856.

OEnothera cruciformis Kellogg, Proc. Cal. Acad. **2**: 227. 1863.

OEnothera scapoidea var. *clavaeformis* S. Wats. Bot. King's Rep. **5**: 109. 1871.

OEnothera scapoidea var. *purpurascens* S. Wats. Proc. Am. Acad. **8**: 595. 1873.

Eastern slope of the Sierra from Oregon to Nevada and southern California; at 400 meters in California.

6b. CHYLISMA SCAPOIDEA CLAVAEFORMIS (Torr.).

OEnothera clavaeformis Torr. Frem. Rep. 314. 1845.

OEnothera scapoidea var. *aurantiaca* S. Wats. Proc. Am. Acad. 8: 595. 1873.

Southern California and Arizona.

7. CHYLISMA BREVIPES (A. Gray).

OEnothera brevipes A. Gray, Pacif. R. R. Rep. 4: 87. 1857.

OEnothera clavaeformis Torr. Bot. Mex. Bound. Surv. 66. In part. 1859.

Southern California and Arizona.

Salix candida Willd, and its Hybrids.*

W. W. ROWLEE AND K. M. WIEGAND.

(PLATE 267.)

Within a radius of twenty miles of Ithaca, New York, there is but a single station for *Salix candida*. This is a swamp, formerly a sphagnous bog, called "Fleming Meadow," two miles south of the city. The swamp is a little higher, possibly fifteen feet, than Cayuga lake. An attempt was made some years ago to drain this and a neighboring bog and thereby to render them suitable for cultivation. The springs of water pouring in thwarted this attempt, and after they had been thoroughly cleared of bushes the attempt to utilize them was abandoned and they were allowed to become wild again.

Salix candida persisted along the margins of the ditches during the attempt to drain the bog. These have filled up and the soil has become again very wet. The willow has now spread somewhat from the ditches. Other willows grow in the bog. *Salix cordata* is more abundant than any other. *S. rostrata* and *S. dis-*

* We have received from the authors photographs illustrating the variation in buds described in this paper. They are willing to send similar photographs to anyone interested enough to pay the cost of printing and mailing—25 cents each. There are three photographs 5x8 inches, and 6 branches, natural size, represented in each.—ED.

color also grow there. *Salix sericea* grows in the immediate vicinity, but has not been detected in the bog. Stations for *S. petiolaris* are known not far from the bog, and it is highly probable that both the species last mentioned grew in the bog before vegetation was disturbed by settlements.

In the spring of 1894 several forms of *Salix candida* were brought into the laboratory, one of which was so unusual in its appearance that specimens were sent to Mr. Bebb. These specimens were from the plant labeled No. 20. Of it in a letter he said, "just at a glance, without a careful examination of minute characters I should take your smoother form to be a hybrid, *Salix candida* × *S. petiolaris*. In addition to the differences from pure *candida* which you mention, you will observe that the aments are borne on slender and more distinctly leafy peduncles. I imagine too that they are more loosely flowered. The capsules are too old to afford a good view of the style (without soaking up, for which I have not the time at present), but I fancy it is shorter than pure *candida*. The leaves have a different outline, being more pointed at base, and exhibit (even in your carefully dried specimens) a slight tendency to blacken, and the margin is less distinctly revolute. It would not be well to rest a decision on the scant material before me, but I have very little doubt that if you carefully study the forms in the locality from which this specimen was obtained, in flower, fruit and mature foliage, you will find convincing proof of hybridity."

Subsequent studies of these specimens during the same summer convinced us that there was a very interesting series of forms in the bog, and in the spring of 1895 a systematic study of them was undertaken. The opportunity for observing the forms is especially favorable, since the whole bog comprises not more than two acres, and the plants in question were all upon one corner of this area. Each individual which promised any appreciable variation from typical forms, as well as a number of apparently typical forms, was given a number and marked with a tag. At the same time a map of the locality was made as a check and as a matter of convenience in finding our plants. Observations were made at frequent intervals, and specimens were taken at three periods during the season: First, at anthesis (April 30); second, when the

capsules were mature (May 17); third, when the leaves were mature (July 13). Specimens of the buds and branches were also taken in March, 1896.

The preliminary comparison of material from each individual, and our conclusions, together with a complete set of our plants, were ready to be sent to Mr. Bebb for his final revision, when the sad news of his death reached us.

The results of our work fulfil Mr. Bebb's prophecy and even more than fulfil it. A whole season's study of No. 20 confirms his provisional diagnosis of it.

There is a specimen from a pistillate plant in the Cornell University Herbarium named by Mr. Bebb, *Salix candida* × *S. petiolaris*, and on the label is printed, "Originally from Hascoll's Swamp, near Flint, Michigan, where it was discovered by Daniel Clarke, M. D., in 1872, the locality soon after being obliterated. Should it be deemed advisable hereafter to treat supposed hybrids as quasi-species after the manner of Andersson, Kerner and others, I very much wish that this beautiful Willow should be called *S. Clarkei*, to commemorate the name of a botanist who has done more than anyone else to give an impetus to the study of hybrid willows in this country." With the specimens are drawings and detailed notes which, so far as the writers know, Mr. Bebb never published.

Our plant differs decidedly from Mr. Bebb's in general appearance. The leaves are larger, much more densely tomentose below, and lighter green above; the capsules are much more densely tomentose at maturity (there is no young material with Mr. Bebb's specimen) and the tomentum is creamy white, whereas in his specimen it is silky and gray. The young catkins in our specimen have that glistening white appearance so characteristic of *S. petiolaris*. A superficial comparison of his plant with ours would lead one to believe them quite different, but closer examination shows that they agree quite closely as to essential characters. The winter buds, which are of much importance in diagnosing willows, indicate too that this is intermediate between *S. candida* and *S. petiolaris*.

It is a significant indication of the accuracy of Mr. Bebb's judgment regarding willows that what he anticipated for this specimen in style and capsule characters should prove so true.

There proved to be some other equally interesting forms in the same swamp. They are our nos. 21, 23, 28 and 84. Everything seems to point to these being hybrids between *Salix candida* and *S. cordata.*

No. 21 at time of flowering might easily be mistaken for pure *Salix cordata.* It is a staminate plant and has the large catkins and general aspect of *S. cordata.* The catkins are "sessile" as in *S. candida.* The young leaves are comparatively smooth, but even in age retain the "candida" characteristics very decidedly. The venation of the leaf resembles that of *S. candida* more than it does that of *S. cordata.* The leaves are lanceolate-acuminate as in *S. cordata.* The petioles are twice the length of the small stipules. The gall which is so abundant upon *S. cordata* in this region is abundant also upon this plant.

No. 23 is a pistillate plant. The capsules in the mature catkin (collected May 17) are acute and still bear the rather long style. They are sparsely tomentose and green and the sutures upon their sides are conspicuous. The leaves when young are densely-tomentose on both sides, the mature ones are whitened below and very veiny, those upon the lower part of the shoot being very sparingly tomentose, tapering nearly equally both ways and acute at both ends. The petioles are not longer than the stipules. The stipules are rather large, obliquely, very broadly ovate, acute and revolute. The winter buds are ovate, acutish, but rounded at the apex, divergent and only slightly flattened. The whole plant seems to be intermediate between its supposed parents.

No. 28 also a pistillate plant, is closely related to *S. cordata.* If it were not for the rugose, slightly revolute inconspicuously toothed, and somewhat tomentose leaves, the long styles and sparingly tomentose capsules, it would be at once so considered. The capsule becomes green and nearly smooth at maturity, but retains somewhat the form of the "candida" capsule. The form of the leaves and stipules, the leafy peduncled catkins, and the size of the plant are all suggestive of *S. cordata.* The winter buds also resemble those of the pistillate plants of *S. cordata*

No. 84 is also a pistillate plant. It bears a close resemblance to *S. candida.* In fact during our first visits to the swamp we took this plant to belong unquestionably to that species and did

not give it a number. The appearance of the mature capsule led us to take specimens May 17th, and the leaves and buds confirm our surmise that this too is an errant form. A peculiar fact is that the plant resembles strongly *S. candida* in its floral and fruiting characters, while it resembles just as strongly *S. cordata* in its leaf and stem characters. The capsule is densely tomentose and the tomentum is in texture and color like that upon the capsules of *S. candida*. Older leaves are nearly smooth and are rugose above, whitened and silky below, the younger ones are covered with scattered white tomentum both above and below. The youngest leaves on the shoot which were still unrolled July 13th, are densely white-tomentose. The mature leaves are rounded at the base, with lanceolate-acuminate outline, and have revolute and very obscurely dentate margins. The stipules are obliquely ovate, broad and toothed, prominently veiny below and longer than the petioles.

No. 90 is another individual which is evidently intermediate between *S. candida* and *S. cordata*. Only the mature leaves and buds are available for study. These are sufficient to show that *S. candida* has some influence in this plant, although at time of flowering the plant was thought to be *S. cordata*. Another season's observations are necessary to determine the place no. 90 should have.

It seems very certain that these individuals are hybrids between *S. candida* and *S. cordata*. The isolation of the former species in this region and the very pronounced characteristics which it possesses makes it a comparatively easy matter to detect a relationship between the forms here described and the typical *S. candida*.

The other element in the mixture is not so constant and well defined. Mr. Bebb in his Notes upon N. A. Willows (Bot. Gaz. 16: 104, 1891), says, "No American willow has a wider distribution than this (*S. cordata*). * * * * None other presents more the appearance of a 'congeries of species in the making.' * * * * Of all our willows, (it is) the one which hybridizes most freely with others, and this implies that even where actual hybridity cannot be proven, it is more or less effected by association with other willows in different portions of this wide area of distribution."

Of the inconstancy of *S. cordata*, Glatfelter (Trans. Acad. Sci. St. Louis, 7: 139, Jan. 4, 1896) states that of 184 specimens of supposed *S. cordata* which he collected at random near St. Louis, "13 were rejected as hybrid *sericea* and *cordata* either fully identified or probable." He also dwells upon the great variability of *S. cordata* and discredits Mr. Bebb's species *Salix Missouriensis*.

Professor Dudley spent much time studying willows about Ithaca. His conclusions (Cayuga Flora, p. 87), verified by Mr. Bebb, were that hybrids between *S. cordata* and related species were not infrequent. It has been a matter of some surprise that Professor Dudley or some other of the many students who have done field work about Ithaca did not discover these plants before. It hardly seems possible that they could have been passed over year after. It seems more probable that they have sprung up within the last ten years, perhaps immediately after the attempt to reclaim the swamp was abandoned.

Salix cordata as it grows about Ithaca is an exceedingly variable plant. It presents several forms and grows along the creeks and in low grounds everywhere.

The winter buds promise to aid much in the determination of species of willows *Salix cordata* and *S. candida* have very different buds. In the former they are large and flattened upon the side next to the branch and appressed. They are acute, the apex frequently reaching the base of the next bud above. They are dull and frequently hairy. In the latter the buds are short, rounded at the apex and decidedly spreading. They are polished and shining. The hybrids all have buds intermediate between the two species; they are more divergent, shorter, and more blunt than those of *S. cordata*, and vary from smooth to hairy.

Not until the winter buds came into consideration did the question of the parentage of our hybrids seem satisfactorily solved. Plate 267 illustrates forms of buds of *Salix candida* and *S. cordata*, and also the buds of the hybrids. The buds of the hybrid plants have the gradually contracted upper portion of *S. cordata*, but are inclined to be blunt. They are not always strictly intermediate between the two parents, but sometimes approach more nearly to one parent or the other. This variation is correlated with the relation of the hybrid to the parents as shown by other characters.

It should be noted, too, in this connection that several spe-

cies show marked sexual variations in the buds and branches. The staminate plants generally have larger and stouter buds and coarser branches. No willow that has come to our attention presents so conspicuous sexual variation as *S. cordata*. The variation relates not only to the size of the bud, but also to the form.

It is highly desirable to prove experimentally that hybridization may take place between these willows, and that as an effect of such hybridization individuals will be produced like our forms. These experiments we propose to undertake. It does not seem desirable to await the result, since European willows, as well as American, are inclined to hybridize freely beyond a doubt, and our observations published may encourage others to report observations upon similar forms.

A detailed description may assist in identifying these forms when found in other places.

Salix candida Flügge × *S. petiolaris* Smith.

Catkins, at anthesis, 2 cm. long, at the time of dehiscence of capsule 4–5 cm., upon slender pedicels which bear two or three foliaceous bracts. The bracts not enlarging as the capsules mature. Catkins rather closely flowered at anthesis, moderately loosely flowered at maturity. Capsules, at anthesis, elliptic-lanceolate, 1 ½ mm. long, style 1 mm., smooth and purple, capsule densely white tomentose, stigmas conspicuously two branched, the apices of the branches two lobed. Pedicels ½ mm., about equalled by the slightly clavate gland, surpassed by the black scales; at maturity lanceolate, 6–7 mm. long and creamy whitish and tomentose, pedicels not longer than at anthesis, the looser character of the catkin being due to the elongation of the main axis.

Leaves narrowly elliptical, tapering very gradually to an acute base and apex, obscurely toothed and scarcely revolute, smooth and light green above, finely tomentose and very white and veiny beneath, petioles 1 cm. long, twice the length of small lance-subulate, revolute stipules. Young leaves showing a decided tendency to blackening in drying.

A shrub two or three feet high diffusely spreading, the young part of the shoots pruinose tomentose, becoming, in age, brown and polished. Buds ovate oblong, blunt, slightly compressed, bud scales chestnut or darker, nearly smooth.

Salix candida Flügge × *S. cordata* Muhlenberg.

Staminate plant. Catkins at anthesis 3 cm. long, stout cylindrical, bracts at base small or none. Scales obovate-spatulate, dark at tip, hair long and crisp.

Leaves 8–10 cm. long, narrowed elliptical, tapering each way from the middle, rounded at base, rugose and very prominently veined, serrulate, light green and mostly smooth above, whitened and somewhat woolly beneath; petioles 8–10 mm. long, slender, stipules ovate, semi-cordate inconspicuously veined ¼–⅓ length of the petiole. Shoot pale chestnut, often hoary. Buds ovate-lanceolate, rather blunt, stout and but slightly flattened. Numerous spherical galls formed of distorted leaves.

Pistillate plant. Catkins at anthesis 2 cm. long, leafy bracted at base. Capsule ½ mm. slender more or less tomentose, styles long or short. At maturity 2½–4 cm., more densely flowered and narrower than in *S. candida*. Capsule in the forms near *S. cordata*, ovate-lanceolate, tapering gradually to the short style, not obtuse, 3–4 mm., long, sutures glabrous and prominent. In forms near *S. candida*, the capsules are larger, 5–8 mm., more obtuse at apex, densely tomentose, sutures not prominent. Style slender, 1–1½ mm., more obtuse at apex, style more slender. Pedicel shorter, not twice the length of the gland scarcely over ½ mm. long.

Leaves large lanceolate, mostly rounded at base, 10–15 cm. long, 1½–2 cm. broad, narrowing to an acuminate apex, somewhat rugose, strongly veined, primary veins nearly horizontal, margins subentire, upper surface becoming glabrous, lower, whitish from nearly glabrous to tomentose. Petioles short, 3–5 mm., stout, stipules longer than the petioles, ovate to broadly ovate, subcordate, veiny, serrate, subacute and revolute.

Shoots long, light chestnut, slender, often tomentose, buds small, ovate, blunt, varying from narrow to broad, more or less compressed, divaricate or appressed.

Cornell University.

Explanation of Plate 267.

Plate I. 1. Leaf of *S. candida* × *S. cordata*. 2. Of *S. candida* × *S. petiolaris*. 3. Of *S. candida*. 4–17. Winter buds collected in March. 4, 5. *S. cordata* (staminate). 6, 7. *S. cordata* (pistillate). 8, 9. *S. candida* × *S. petiolaris* (pistillate). 10, 11. *S. candida* (staminate). 12, 13. *S. candida* (pistillate). 14, 15. *S. candida* × *S. cordata* (pistillate). 16, 17. *S. candida* × *S. cordata* (staminate).

Observations on Antidromy.

By George Macloskie.

It was stated in the Bulletin of September and November, 1895, that every species of flowering plant, including Gymnosperms, appears to havetwo castes of individuals, which are two reversed counterparts of each other, as our right and left hands are. This 'antidromic' diversity is evidently a primitive character, and seems to pervade the whole organization of the plant; so that when it is masked or disturbed by secondary changes in one part we may detect it in others. Thus in *Berberis* and in *Cardamine* you may find it difficult to determine the antidromic phyllotaxy, but the order of flowers in the racemes is manifestly antidromic. The opposite leaves of *Acer* render it difficult to trace the right course of the spiral, but here the anthotaxy assists, and also in the seedling we are guided by the position of the first pair of foliage-leaves relatively to the cotyledons, in some individuals crossing somewhat to the right, in others somewhat to the left, when the same orientation is maintained. Whether we do or do not know the real significancy, the facts themselves are too definite to be any longer overlooked; and my present contribution is designed to add some new observations which must be taken account of as part of the data.

Erythronium is a good illustration of the unexpected way in which the evidence may come up. Hold the plant with the outer or sheathing leaf towards you, then some of the plants have the solitary flower nodding over to your right, and others have it nodding to your left. Spring-beauty (*Claytonia Virginica*) carries the same system further, and also introduces an additional factor. Hold a specimen with the two fleshy leaves next you, and note that the lowest flower arises to your right side from the peduncle, the bract arising towards your left side; another specimen held in the same way has the first flower on your left side, and order of bracts and subsequent flowers antidromic as compared with the first specimen. A new point in this is that the same tuber may have half a dozen plants, which are half and half of each caste according to some definite law. Thus the derivatives of the same tuber appear to be relatively antidromic, like the embryos pro-

duced by seeds from opposite sides of the same carpel. In my first paper I referred to *Iris* and to *Richardia* as having antidromic plants from the same rootstock; and now I find this to be the general system. Thus the skunk cabbage (*Symplocarpus foetidus*), of the same order as *Richardia*, has the spathes of a single plant always of the same kind; but nearly always the same clump has plants differing in the order of phyllotaxy and in the form of the spathes. In *Helonias* (of Liliaceae) the thick rootstock bifurcates so as to have two arms like the letter Y; and if you hold it with the branches of the Y towards you, the plant or plants borne on the branch next your right hand are evolved counter-clockwise (*i. e.*, with dextrorse phyllotaxy), whilst the plant or plants borne on the branch next your left hand are evolved clock-wise or sinistrorsely. This is as was noted in *Iris*, which belongs to a different order of plants. The two or three flowers along one arm being of the same caste remind us of the seeds borne on one valve of a bean-pod being alike to each other and being the antidromes of those on the opposite valve. In *Podophyllum* the examination is more troublesome, but so far as I can determine the result is the same. If we hold the plant with the smaller of the peltate leaves next us, then the uppermost of the sub-leaves (niederblätter) at the base of the stalk is next us, its tip towards our right and the other sub-leaves following in definite order in one plant, and all these relations reversed in another plant. In one plant thus held, the flower starting from the fork of its stalk turns to my right hand and in another to my left hand; the flower to my right has its most prominent sepal and its placenta distad-dextrad, and in the other plant these parts are distad-sinistrad. This diversity can be observed in very young plants starting from the ground. (In one specimen I found two flowers turning right and left respectively.) Now the underground stem sometimes bifurcates, one of its branches bearing one or more plants which are the antidromes of those borne by the other branch. In the same clump of *Carex* we find different individuals with antidromic phyllotaxy and antidromic order of evolution of flower-spikes. Perhaps these observations may cast some light upon the curious case of *Liquidambar* where the same tree may have antidromic branches; whilst some definite law seems to hold in them all.

The case of *Viola* may be cited because of its difficulty. The leafy stemmed Violets baffle us because of the angle of divergence being nearly that of a semicircle; the rosettes of the stemless species are not easily resolved, but in some cases, as *V. lanceolata*, etc., they seem to be antidromic. The flower on each peduncle being solitary, we can get no aid from the anthotaxy. The spur of the flowers furnishes a landmark, but whether this is antidromic or only of recent origin I have not been able to prove. If you hold a violet-flower with the spur towards you, in some cases the spur will protrude to your right of the pedicel, in other cases it will protrude towards your left.

This distinctive peculiarity cannot arise from the direct influence of sunlight, as it is shown by the very young flower-bud. I have not succeeded in correlating it with antidromic phyllotaxy; but generally all the flowers of one plant appear to be of the same caste, and the flowers of different plants from the same rootstock appear to differ. But the case is complex; thus a fleshy rootstock of *V. pedata* had four fleshy branches, each of them bearing a number of plants; branch 1 and 2 had each three flowers, two of them with spur to right, one with spur to left, and phyllotaxy dextrose; branch 3 was in all respects the converse of the others, and branch 4 was small and bore no flowers. Possibly the quasi-antidromy of these may be of the same character as in *Hibiscus*, where the same branch may have flowers twisted in contrary directions; this explanation may apply also to the cases reported to me by my friend, Arthur K. Harrison, of Lebanon Springs, N. Y., about the catkins of birches and *Ostrya*, of which he writes: "Whenever they occur in pairs it is the rule for one to be dextral and the other sinistral, the whorl in each rolling outward from the axis as viewed from the upper (inner) side of the branch; where there are three or more aments the central (end) one whorls sometimes one way, sometimes the other, depending, I think, upon which side of the branch they originate from," and he thinks the same rule applies to all species bearing terminal clustered catkins.

In my paper of November last I referred tentatively to some facts that seem to introduce the Ferns into the realm of antidromy. This view is confirmed by observations on the vernation of Cinnamon-Osmund. The fronds, in starting in the center of the

plant, arise clockwise in some plants and counter-clockwise in others. I think that *Isoetes* affords similar evidence; but I have not been able to satisfy myself on this point.

The rootstock of the yellow waterlily (*Nuphar*) shows in its leaf-scars the order of development of the leaves to be distinctly antidromic as between two segments borne by the same stock; in the specimen before me the leaf-scars on the mother stock and on the right arm of the Y-like rootstock are arrranged in sinistrorse order, whilst those on the left arm are dextrorse. The following extract from a letter sent by my young friend, Professor Francis E. Lloyd, of Pacific University, Oregon, is very interesting, as it gives a connecting link between the antidromy of *Liquidambar* and that of rootstocks,—"I find that *Acer circinatum*, a plant o very singular habit, shows antidromy as between branch and branch in dichotomy. I am not sure of any observations. The plant is a shrub or small tree, and branches dichotomously with great regularity and the two branches of the Y twist to the right and left respectively." This is precisely as in the rhizome of *Helonias*. Professor Lloyd promises to report his observations; and I hope he will extend them to other plants on the Pacific coast.

PRINCETON COLLEGE, May 19, 1896.

New Species of Fungi from Mississippi.

BY S. M. TRACY AND F. S. EARLE.

In the BULLETIN for May, 1895, the writers described a number of new species of parasitic fungi, nearly all of which had been collected in Mississippi. During the past year we have identified a number of additional species, which are described here. Type specimens of all are in the herbaria of the authors, and of nearly all in the herbaria of the Department of Agriculture, Rutgers College, and Columbia and Harvard Universities.

CERCOSPORA CORNICOLA n. sp.

Epiphyllous, on irregular brown deadened spots without a definite border, 5–10 mm. Hyphae densely clustured from a nodular base, very short, continuous, somewhat flexuous, olivaceous, 11–15 by 3–4 μ; conidia slender, thread-like, somewhat

curved, mostly continuous, hyaline or light olivaceous, 60–70 by 2–3 μ.

On languishing leaves of *Cornus florida;* Ocean Springs, Miss., September 29, 1895.

CERCOSPORA GLOTIDIICOLA n. sp.

Forming greenish black definite areas. Hyphae in small fasciculate clusters from a nodular base, 1–2-septate near the base, fuliginous, somewhat flexuous or geniculate, 50–70 by 5–6 μ; conidia slender, clavate, hyaline, faintly 2–5-septate, 70–80 by 2–4 μ.

On ripening legumes of *Glotidium Floridanum* with *Macrosporium Floridanum.* Ocean Springs, Miss., September 25, 1895.

CERCOSPORA MINIMA n. sp.

Epiphyllous, on brown irregular indeterminate areas. Hyphae densely caespitose, very short, continuous, flexed and irregular, olivaceous, about 10–15 by 4 μ; conidia thread-like, hyaline, faintly septate, 40–60 by 2 μ.

On *Pyrus communis*, Biloxi, Miss., September 2, 1895.

CERCOSPORA MYRICAE n. sp.

Epiphyllous, on dark brown indeterminate areas. Hyphae densely caespitose from a common nodular base, flexuous, 1–2-septate, light fuscous, 30–40 by 3–4 μ; conidia narrowly clavate, faintly several septate, hyaline, 100–125 by 3 μ, occasionally 175 μ long.

On *Myrica cerifera* var. *media*, Ocean Springs, Miss., September 15, 1895, and March 7, 1896.

CERCOSPORA SEPTATISSIMA n. sp.

Amphigenous, at first forming dark olivaceous angular areas bounded by the veins, at length widely effused; hyphae densely caespitose, irregularly bent and flexed, dark fuscous, distinctly many-septate, 40–60 by 5–6 μ, the septa usually only 4–6 μ apart; conidia slender, clavate, faintly septate, hyaline, 50–60 by 3–5 μ.

On *Verbena Caroliniana*, Columbus, Miss., October 12, 1895.

CERCOSPORA STYLISMAE n. sp.

Amphigenous, spots 2–3 mm. wide, white, surrounded by a dark raised border; hyphae in small slightly divergent clusters, nearly straight, fuscous-olivaceous, uniseptate near the base, 40–50 by 5–6 μ; conidia clavate, hyaline, faintly 3–5-septate, 50–70 by 4–5 μ.

On *Stylisma humistrata*, Columbus, Miss., October 16, 1895.

GLADISPORIUM XYRIDIS n. sp.

Blackening the persistent withering petals. Mycelial threads

effused, slender, not nodular, branching, occasionally septate, fuliginous, 3–4 μ in diameter; conidia oval or somewhat fusiform, lighter colored than the mycelium, at length uniseptate, 7–10 by 4–5 μ.

On *Xyris fimbriata*, Ocean Springs, Miss., September 29, 1895

GLONIUM MACROSPORIUM n. sp.

Perithecia scattered, black, carbonaceous, broadly oval, obtuse' indistinctly longitudinally striate, lips closely connivent, about 1 mm. long; asci cylindrical, thin-walled, 8-spored, paraphysate, about 200 by 35–40 μ; sporidia very long, cylindrical, slightly curved, obtuse, unequally uniseptate, somewhat constricted, hyaline or at length slightly tinted, 60–70 by 12–15 μ.

On dead twigs of *Persea palustris*, Ocean Springs, Miss., May 26, 1895.*

The spores are twice as large as in any described species of *Glonium*. It approaches *Tryblidium* in its occasionally tinted spores, and there is one species, *T. turgidulum* P. & H. with spores even slightly larger than these.

HELMINTHOSPORIUM GENICULATUM n. sp.

Blackening the spikelets. Hyphae thinly effused, flexuous, nodular, septate, dark fuscous, 100–125 by 4–5 μ; conidia obtuse-fusiform, usually 4-septate, fuscous, central cell darker, apical cells lighter and nearly hyaline, usually abruptly geniculate on the enlarged central cell, 35–40 by 8–10 μ.

On *Eragrostis rachitricha* grown from imported seed, Starkville, Miss., October, 1894.

LEMBOSIA OLEAE n. sp.

Hypophyllous, spots none; perithecia scattered, large, flexuous and often branched or compound, about 400 by 80–100 μ; subiculum abundant, of long slender fuscous branching matted threads, 100 or more by 2–2.5 μ; sporidia unequally uniseptate, the shorter cell narrower, hyaline (but evidently immature), 12–15 by 4 μ.

On leaves of *Olea Americana*, Ocean Springs, Miss., February 4, 1894, and September 19, 1895.

LEMBOSIA ANDROMEDAE n. sp.

Hypophyllous, without definite spots; perithecia scattered or gregarious, linear and occasionally flexed, seldom branched, 250–400 by 50–90 μ; subiculm copious, of loosely interwoven and anastomosing fuscous threads, 25–40 by 2–3 μ; spores unequally

* Also found at Auburn, Ala., on various dead twigs. February, 1886.

uniseptate, oval or biconic, hyaline (perhaps immature), 8–9 by 2.5–3 μ.

On leaves and stems of *Andromeda nitida*, Ocean Springs, Miss., May 26, 1895.

This resembles *L. Oleae* in its hypophyllous growth, lack of spots or evident mycelium, and in its elongated stipitate asci, but it averages smaller and narrower, and has a less abundant and very different appearing subiculum. The two species seem to form a natural section or subgenus quite different from the other species, which are epiphyllous on more or less distinct spots, and with broadly oval or orbicular asci.

LEMBOSIA CLIFTONIAE n. sp.

Epiphyllous, on small irregularly rounded whitened areas 1–2 mm. in diameter; perithecia small, oval or linear-oval, usually straight and simple, rather thick and dense, 100–150 by 40–70 μ; subiculum very scanty or almost wanting, of few dark colored nodular flexuous threads, 15–25 by 2–3 μ; asci obovate, 20–25 by 10–15 μ; sporidia oval or biconic, about equally uniseptate, light fuligenous, 9–11 by 4–5 μ.

On living leaves of *Cliftonia ligustrina*, Ocean Springs, Miss., September 14, 1895.

LEMBOSIA ILICIS n. sp.

Epiphyllous, on ash-colored spots 3–5 mm. in diameter; perithecia usually linear and simple, rarely branched, 200–300 by 70–80 μ; subiculum of numerous slender fuscous threads, 15–20 by 2–3 μ; asci oval or oblong, not sipitate, 20–25 by 10–12 μ; sporidia elliptical, about equally uniseptate, slightly constricted, becoming olivaceous, 8–10 by 2.5–3 μ.

On living leaves of *Ilex glabra*, Ocean Springs, Miss., August 25, 1895.

The microscopic characters are much as in *L. angustiformis* T. & E. on *Ilex coriacea*, but the sporidia are even smaller and more delicate, the stellate blisters so characteristic of *L. angustiformis* are wholly wanting, and the gross appearance on the leaf is quite different.

LEMBOSIA RUGISPORA n. sp.

Epiphyllous, on irregularly rounded, dark brown spots covered with a radiating mycelium; spots 1–3 mm. in diameter; perithecia often stellately compound, or variously branched, about 400 by 100 μ when simple; subiculum rather scanty, of two kinds of

threads, one pale, multiseptate, about 3–3.5 μ thick, the other darker, mostly continuous, frequently anastomosing, 2.75–3 μ, the darker threads bear occasionally erect sessile 4–8 septate dark fuscous clavate conidia, 30–45 by 7–8 μ; they also bear occasional sessile orbicular one-celled dark opake bodies (hyphopodia?) 5–6 μ in diameter; asci oval, 25–35 by 20–25 μ, sporidia large, oval, about equally uniseptate, at length dark fuscous, 15–20 by 8–10 μ. When fully matured and freed from the ascus the surface of the sporidia is seen to be prominently roughened by small wart-like projections.

On living leaves of *Persea palustris*, Ocean Springs, Miss., May 26, 1895.

LOPHODERMIUM CYRILLICOLUM n. sp.

Amphigenous, on irregular brown sub-arid red-bordered spots; perithecia innate, depressed and finally collapsing, broadly oval, lips connivent, 1–1.5 mm.; asci cylindric-clavate, about 65–75 by 10 μ; paraphyses very numerous, thread-like, exceeding the asci, tips not recurved; sporidia filiform, nearly equalling the ascus, straight and parallel with it.

On living leaves of *Cyrilla racemiflora*, Ocean Springs, Miss., November, 1894.

PESTALOZZIA UNISETA n. sp.

Acervuli scattered, erumpent, oval or elliptical, opening by an irregular elongated fissure, 50–100 by 100–200 μ; conidia elliptical, often somewhat curved, 5-septate, the four medial cells dark fuscous, terminal cells hyaline, 25–30 by 7–8 μ; arista single, hyaline, 8–10 μ long, abruptly bent at a sharp angle with the spore; stipe very short, bent to the same side as the arista.

On bark of "Prof. Gulley" grape, Starkville, Miss., March 16. 1896.

SCOLECOTRICHUM EUPHORBIAE n. sp.

Hypophyllous, forming prominent olivaceous tufts; spots none; hyphae very numerous, in large tangled clusters, long and flexuous, olivaceous, occasionally septate, marked for more than half their length by scars left by the pleurogenous conidia, 225–275 by 4–5 μ; conidia oval or obovate, with a distinct scar at the base, hyaline, minutely granular, continuous or at length faintly uniseptate, not constricted, 20–25 by 7–8 μ.

On *Euphorbia Preslii*, Starkville, Miss., Sept. 27, 1895. Also from Auburn, Ala., September, 1892 (Duggar).

This is placed here with considerable doubt, as the hyphae are quite different from those of any described species of *Scoleco-*

trichum, though the conidia appear to be typical. It is perhaps generically distinct, but rather than establish a new genus in this already overcrowded and confused group, we write it as above.

TILLETIA CORONA Scrib.

This striking smut was first observed by Scribner on *Homalocenchrus oryzoides* and *H. Virginicus* near Washington, D. C., in 1886, and specimens collected by him were distributed by Ellis under the above name in N. A. F., as No. 1896. It has since been collected by Waite in Illinois and Missouri on *Homalocenchrus*, on *Panicum virgatum* in Illinois, and by the writers in Mississippi on *Homalocenchrus lenticularis* and *H. Virginicus* at Columbus, on *H. lenticularis* at Bairds, and on *Panicum sanguinale* at Starkville. Specimens on *Panicum virgatum* in the herbarium of the Division of Vegetable Pathology at Washington bear the unpublished herbarium name *T. pulcherrima* Ell. and Gal., but they seem identical with the forms on the other hosts. As no description of this species has been published, we make the following, drawn from an examination of all the above mentioned material.

TILLETIA CORONA Scrib.

Infesting the ovaries, transforming them into black curved horn-shaped masses sometimes 1 cm. in length, the outer covering firm in texture, showing traces of the cellular structure of the ovary; spores large, spherical, 22–26 μ, dark fuscous and densely opake when mature, but covered with a hyaline envelope 2 μ or more in thickness, the surface of the dark central mass covered by minute but deep alveolations, this structure being obscured by the opacity of the mature spore, when the thin alveolar walls can be seen only at the periphery, where they appear like numerous spinous projections reaching almost through the hyaline envelope. The remains of the fruiting hyphae often persist on the younger spores as a false pedicel.

On various grasses, Mississippi, Illinois, Missouri and Washington, D. C.

Several other species of *Tilletia* have similar large spores with a hyaline outer covering, but in the others the spores are less dark and opake, and the alveolar reticulations are much larger and more easily recognized. These species form a natural group quite distinct from the other *Tilletias*, and might well be considered as constituting a distinct genus.

USTILAGO SPOROBOLI n. sp.

Infesting the ovaries, forming a hard greenish compact mass 2–3 mm. in diameter; spores dark fuscous, oval or subglobose; epispore thickly covered with broadly conical tuberculations, 12 to 12 by 15 μ.

On *Sporobolus junceus*, Columbus, Miss., October 12, 1895.

Usually but few infested ovaries occur on a plant, and the panicle retains its normal form.

WINTERIA LOBATA n. sp.

Hypophyllous, superficial; perithecia scattered, turbinate, collapsing to patellate, and becoming variously ridged and lobed on the thick margins, thin, fragile, not distinctly cellular, black externally and greenish blue within, 300–400 μ; asci numerous, thin-walled, ovate, short-pedicellate, about 35 by 15 μ, involved in the thread-like gelatinous greenish paraphyses; sporidia hyaline, narrowly elliptical, acute, faintly 3-septate.

On living leaves of *Ilex coriacea*, Ocean Springs, Miss., February 16, 1894, and August 20, 1895.

The February specimens seem slightly immature, so that the characters of the sporidia are made out with difficulty, and the August specimens appear to be entirely sterile. The same fungus has been detected with specimens of *Asterina peliculosa* on the same host collected in Florida by Th. Holm, and in Georgia by M. B. Waite.

ZIGNOELLA MAGNOLIEAE n. sp. (Subgenus Trematostoma).

On whitened areas, thickly scattered and sometimes confluent, hemispheric, base slightly sunk in the matrix, rounded above, not papillate, finally opening by a large round ostiolum, black, carbonaceous, surface roughened, about ½ mm. in diameter; asci narrowly elliptical, long-stipitate, 130–150 by 12–15 μ; paraphyses filiform, abundant, exceeding the asci; sporidia hyaline, elliptical, ends rounded, 4-guttate, finally 3-septate, not constricted, 22–24 by 5–6 μ.

On bark of dead *Magnolia glauca*, Ocean Springs, Miss., March 7, 1896.

Jasione montana in New England.

In the summer of 1894 a fragment of a plant was handed to me by Mr. J. T. Smith, who collected it the year previous (July, 1893), while wheeling along the old West road on Conanicut Island, R. I., where, as he said, it grew in "great profusion." The specimen was so fragmentary that little attempt was made to determine its name, but it was laid aside with the data to await future collections or information.

Early in July, 1895, a complete plant of the same was sent from Conanicut Park by Mrs. H. R. Teel, with a request for its name. It proved to be the European Sheeps's-bit (*Jasione montana* L.). Early in August (1895) I visited the island and walked the whole length of the West road, from the north end of the island to the village of Jamestown. From observations on this walk, and from information furnished by Mrs. Teel, who has resided on the island for more than a dozen summers, I learned that the plants have been growing for at least five years, at a station about 1¼ miles southwest of the Conanicut Park Hotel, where, at the time of my visit, it gave a decided blue tinge to several acres of fields and sandy roadsides. The field where it was most abundent showed signs of having once been cultivated, but not very recently.

It is reported to grow sparingly on the East road about a mile from the above mentioned station, and the specimen sent by Mrs. Teel was from the East road about one-fourth mile south of the hotel. Specimens have also been collected by A. Green, Esq., Mrs. S. O. Metcalf and others, at the West road station. Mr. Greenman of the Gray Herbarium writes that it was reported to them from Reading, Mass., in 1891 by Mr. W. H. Manning. The last mentioned botanist informs me that a few plants only were noticed, growing with *Filago minima*, between rows of young nursery stock imported from France, but he believes it did not appear the next year. He has an idea that it is growing on the Boston Back Bay Fens, but is not sure. According to Prof. Britton it has been collected on ballast grounds on New York Island, as shown by specimens in Columbia University Herbarium.

Perhaps some readers of the BULLETIN can add to this record. If so, the writer would be pleased to hear from them. Can any-

one give any definite information in regard to the Boston Back Bay locality?

The plant, as it occurs in Rhode Island, is 1½–2 ft. high, sometimes scarcely branched, but usually much branched either below or above; with solitary naked pedunculate involucrate head-like clusters of blue flowers, ½–¾ of an inch in diameter. Flowers pedicellate; calyx-lobes and the divisions of the deeply parted corolla linear; anthers united; ovary and fruit 2-celled; ovules and seeds numerous. J. FRANKLIN COLLINS.

BROWN UNIVERSITY HERBARIUM, PROVIDENCE.

Botanical Notes.

The second annual meeting of the Botanical Society of America will be held in Buffalo, N. Y., on Friday and Saturday, August 21 and 22, 1896. The Council will meet at 1:30 p. m. on Friday, and the Society will be called to order at 3 p. m., by the retiring president, Dr. William Trelease, Director of the Missouri Botanical Garden. The President-elect, Dr. Charles E. Bessey, Professor of Botany in the University of Nebraska, will then take the chair. The afternoon session will be devoted to business. At the evening session the retiring President will deliver a public address on "Botanical Opportunity." The sessions for the reading of papers will be held on Saturday at 10 a. m. and 2 p. m. The Botanical Society of America is affiliated with the American Association for the Advancement of Science, whose sessions this year begin on Monday, August 24th, in Buffalo.

C. R. BARNES, *Secretary.*

Reviews.

The Structure and Development of the Mosses and Ferns (Archegoniatae). By Douglas Houghton Campbell. 544 pp. 8vo. Price $4.00. Macmillan & Co. 1895.

This book has been welcomed by all students of the Mosses and Ferns and has everywhere been received with gratitude. From the fact that it gives us in a compact form and clear style the most recent results of foreign investigation into the life-history and em-

bryogeny of these plants, with a complete index to the literature from which these results have been obtained, it is invaluable; and its worth is further enhanced by the original investigations which Dr. Campbell has made upon some of our native species. We welcome these with peculiar pleasure, and have only ourselves to blame, if from a systematic standpoint we can see where it might have been bettered. The chapter on the Bryineae is peculiarly interesting to us, for the light thrown by morphological investigations into several mooted questions of classification is particularly welcome at this time. There is great divergence of opinion among recent monographers, as to the systematic position of the cleistocarpous mosses. Braithwaite scatters them among the higher families of mosses, and Limpricht recognizes fifteen genera, including some species which are very doubtful, such as *Physcomitrella Hampei* Limpr. Dr. Campbell gives us the comparisons between *Ephemerum*, *Phascum* and *Pleuridium* with *Funaria*, and the results are very interesting, but we venture to suggest that there are two American mosses which would better represent perhaps the two extremes, *Micromitrium megalosporum* Aust. and *Bruchia longicollis* Eaton. The morphology of the stem and leaves in *Fissidens*, *Bryoziphium*, *Schistostega* and *Leucobryum* are also particularly instructive from a systematic standpoint, as well as the conclusions reached with regard to the place which *Archidium* and *Buxbaumia* should hold as the extremes of differentiation in the sporophyte. We are pleased to see that *Archidium Ravenelii* Aust. has been figured by Dr. Campbell, and agree with him that the question as to whether the cleistocarpous mosses are rudimentary or degenerate forms is a difficult one to decide; yet we feel a personal bias toward the opinion that they are primitive forms.

E. G. B.

Wild Flowers of the North-Eastern States, being three hundred and eight individuals common to the northeastern United States, drawn and described from life. Ellen Miller and Margaret Christine Whiting. Cloth, 4to, pp. 622, plates 308. G. P. Putnam's Sons, New York, 1895.

This is the latest of the many recent attempts to popularize and render easy the study, or rather the naming, of plants. The work makes no pretense of being scientific, and the authors state

that the collection of flowers represented on its pages was gathered together "with the hope of making their acquaintance more easy to non-scientific folk than the much condensed manuals of our flora are able to do."

The family sequence is that of Gray's Manual, as is also the nomenclature and terminology, in regard to which the authors ingeniously remark: "The choice of botanical terms has been intentionally confined to those which long usage has so wrought into common speech that they have practically ceased to belong to strictly scientific nomenclature."

The figures are sketchy, but are perfectly true to nature, are entirely lacking in stiffness or conventionality, and give in every instance an excellent general idea of the plant's appearance in the field. The descriptions are simple; they include both the botanical and popular names, and many little notes and hints which never find place in a scientific work. The exceedingly popular style of the text which prevails throughout may be judged from the following extract under "*Hypericum maculatum*, Lesser St. John's Wort. * * * This little plant's habits are in marked contrast to its larger brother John, for it is as tidy in rolling up into tiny bundles its faded petals as the other is careless of appearances."

Taken all in all, the book will always be useful for assistance in determining the names of the plants which are figured, and it is a matter for regret that the work has not been carried any further. It compares more than favorably with most other works of its kind. A. H.

Notes on the ninth Edition of the London Catalogue of British Plants. G. Claridge Druce. Annals of Scottish Natural History, 1896: 38–53.

Our attention has been called to this interesting paper by the learned editor of the "Journal of Botany" in the February issue of his now happily enlarged organ. Mr. Druce's review of the "London Catalogue" is critical and valuable, including matters of typography, classification, generic limitations, capitalization of specific names, citation and nomenclature. He points out that a large number of generic and specific names adopted in the Catalogue are antedated by others, and calls for the abandonment of

the newer ones. We quote a few sentences, in order to show that Mr. Druce is sound on principles of nomenclature:

"The names adopted for many plants differ from those given in the preceding Catalogue; but the change is in almost all cases caused by following the only safe guide, *i. e.*, the law of priority of nomenclature."

"Many of the names given in the Catalogue do not follow the law of priority. It would be well to carry out this law as far as possible."

"In the Catalogue brackets are used to enclose the names of some authorities for varietal names. They appear to be used when a writer has described as a species a plant to which is now given only varietal rank, or when a writer has placed it as a variety of a species which then bore a different name from the one now employed."

"In the preface, as already alluded to, a statement is made that pre-Linnaean authorities for genera are not cited. It would have been better to have made the statement more precise, and to have stated that the date whence the citation, either of species or genera, should commence, is the year 1753, when the 'Species Plantarum' was published—the first work in which the binomial system of nomenclature was consistently adopted. As it is, in the present Catalogue the names of several authors which are cited are, strictly speaking, pre-Linnaean; that is, they published the genera to which their names are attached before the issue of the 'Species Plantarum.' By citing authors before the date 1753 (and after the first edition of the 'Genera Plantarum' in 1737) a host of genera are brought into competition with existing names, a danger which it would be well to avoid. Also the date 1753 received the assent of the late Alphonse de Candolle when the writer suggested it to him shortly after the publication of Kuntze's 'Revisio Generum Plantarum,' with its vast number of changes of plant names. Moreover, this date has been recommended by the Berlin committee of botanists, as well as by the conference of botanists which met at Genoa; and it is adopted by the majority of botanists in Europe and America."

"To one method of citation used in the Catalogue the writer must raise a protest, as it seriously threatens to hinder that uni-

formity of nomenclature which can be obtained only by adopting the law of priority. Mr. Hanbury himself, in his arrangement of the Hieracia, consistently and correctly uses the Linnaean names of *Hieracium alpinum* and *H. Murorum* in a more restricted sense than did Linnaeus."

"But, unfortunately, another practice, which is, I think, to be strongly deprecated, has been followed in some cases, which consists in giving up the older name, which, according to the rule of priority, should be adopted for a more recent one, because the species as first described is now considered to be made up of more than one species." N. L. B.

Flora of Nebraska, part 21, Rosales. Per Axel Rydberg. Edited by the members of the Botanical Seminar of the University of Nebraska. Lincoln, 1895 (issued December 30). $1.00.

This is a very welcome addition to local botany and is the second part issued of this excellent work.

After discussing certain points concerning the morphology and terminology of different parts of the flower, the author takes up the order of Calyciflora, beginning with the family Rosaceae. Schemes of the relationships of the higher groups are inserted and keys to all the groups from the suborders to species are given. The idea in the treatment of the families and species is segregation, thus avoiding much confusion. In place of Leguminosae we find Caesalpinaceae, Mimosaceae and Papilionaceae, while the Grossulariaceae are taken out of Saxifragaceae.

Psoralea collina, Kuhnistera candida diffusa, Lathyrus ornatus flavescens, L. ornatus incanus and Ribes aureum chrysoccum are described as new. The nomenclature is based on the most advanced and practical ideas. An excellent feature of the work is the numerous original plates which contain figures showing the diagnostic characters of the several tribes. All the Nebraska species of *Astragalus* are figured. J. K. S.

The Potomac Formation. Lester F. Ward. 15th Ann. Rept. U. S. Geol. Surv. 1893–94 [Washington, 1895], 307–397. *pl. 2–4* and illust. in text.

The value of this contribution will be appreciated by the geologist more than by the botanist, but the botanist will find it of interest for the reason that palaeobotany plays such an impor-

tant part in it throughout. The flora of the Potomac Formation is represented in part by the most ancient dicotyledonous angiosperms of which we have any knowledge—archaic types, in which the outlines of subsequent modern genera are foreshadowed. The following new species are figured: *Scleropteris Vernonensis*, *Zamia Washingtoniana*, *Casuarina Covillei*, *Sagittaria Victor-Masoni*, *Antholithus Gaudium-Rosae*, *Populus Potomacensis*, *P. auriculata* and *Celastrophyllum Hunteri*.

As a demonstration of the value of palaeobotany in determining the stratigraphic relations of beds this contribution is a masterpiece and its appearance will be welcomed by all workers in the geology and palaeontology of the central plain region.

A. H.

Proceedings of the Club.

TUESDAY EVENING, APRIL 9TH, 1896.

President Brown in the chair and thirty members present.

Miss Fanny A. Mulford and Mr. Charles W. Mulford were elected active members.

Dr. Schneider read his announced paper, "The Uses of Lichens," giving an instructive account of the past and present uses of these plants in medicine and the arts.

The next paper was that of Mr. P. A. Rydberg entitled "Preliminary notes on a Revision of the North American Species of *Potentilla* and related Genera." This was accompanied by numerous specimens and drawings and elicited remarks from the President and Mrs. Britton.

Mrs. Britton then read a paper, "Notes on Mexican Mosses," giving a short historical account of the various collections of mosses which have been made in Mexico and in comparing the number of genera and species common to Mexico and the United States. Numerous specimens were exhibited.

WEDNESDAY EVENING, APRIL 29TH, 1896.

President Brown in the chair and sixty-four persons present.

Dr. Britton announced his associates on the Field Committee

as Messrs. Fay and Stottler. He reported eighteen persons present at the Field meeting of April 25th, at Prince's Bay, S. I.

Major Timothy E. Wilcox, of Fort Schuyler, N. Y., then read his paper, "Botanizing in Arizona," describing many of the little known plants of that Territory, and ascribing to some of them quite new economic values. Lantern slides from original photographs were shown.

Mr. Cornelius Van Brunt rapidly exhibited a number of colored lantern slides of plants growing in the city parks, accompanying them with short descriptions and anecdotes. Most of these slides had never been exhibited before. In response to a request, he described how Mrs. Van Brunt had colored these slides entirely by hand, by the use of aniline pigments, the ordinary gelatine plates being used for the photographs.

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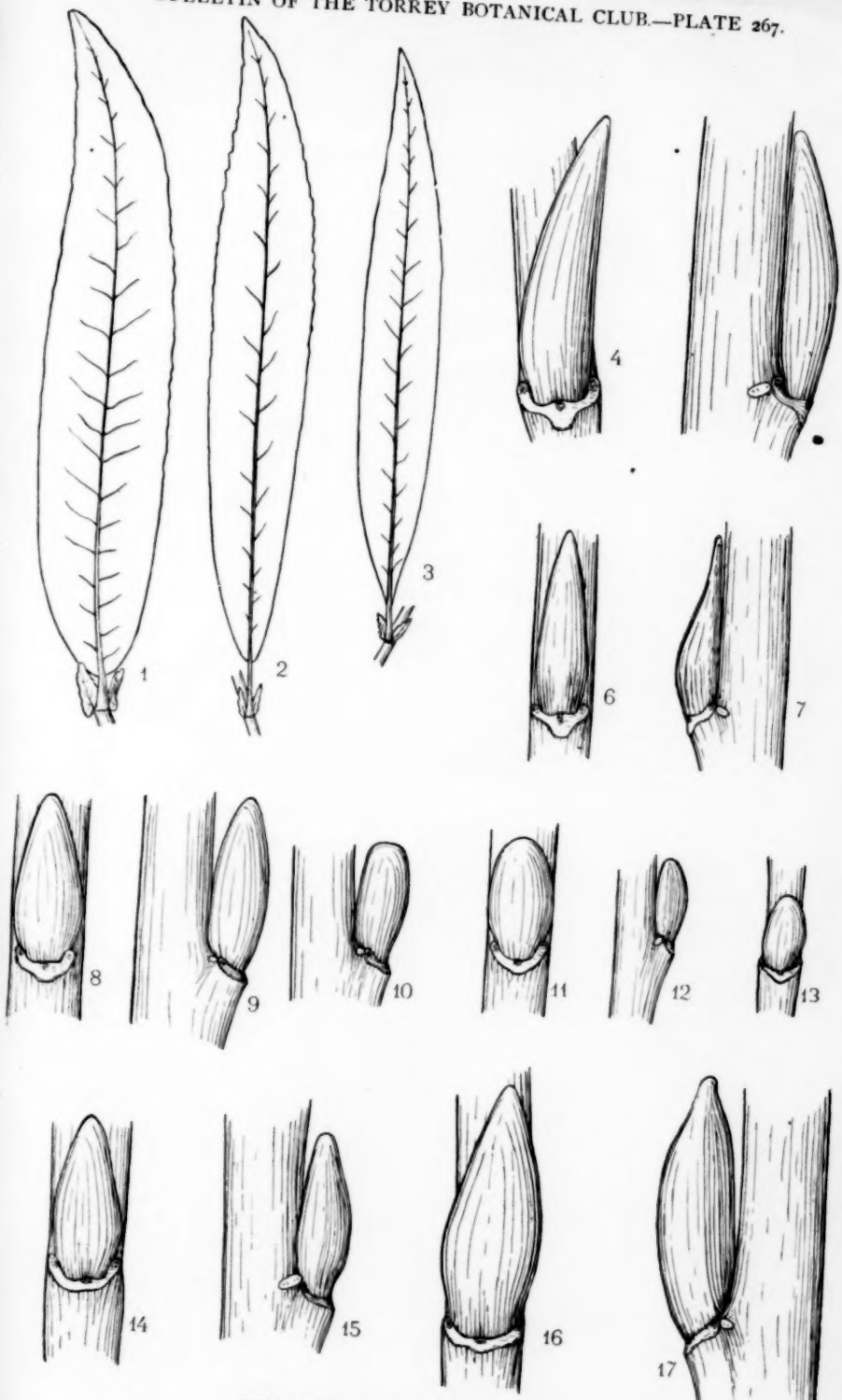

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